Electrical World

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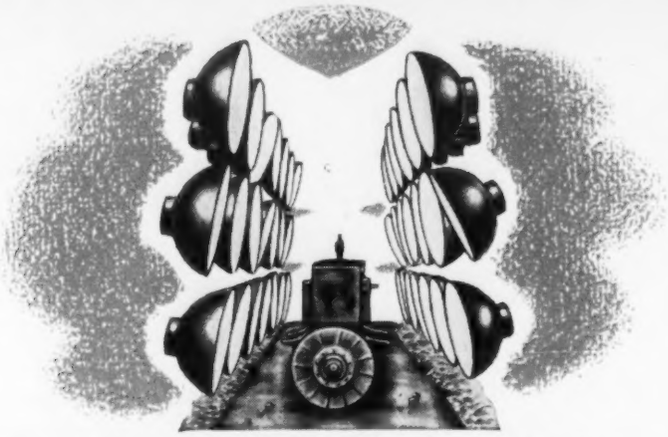
NEWS ISSUE

FEBRUARY 13, 1943

SHIPSHAW BUILDER — McNeely Dubose, power director for the Aluminum Company of Canada was the directing genius behind construction of the giant Shipshaw project—$106,000,000 hydro development built secretly in northern Quebec, which will have an ultimate installed capacity of 2,040,000 hp.

Electrical Ideas in Action!

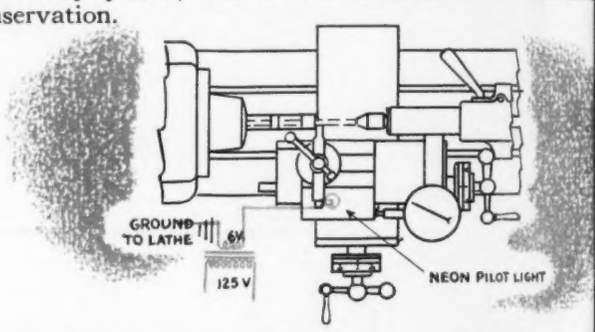
HELPING TO MEET AMERICA'S WARTIME NEEDS



RESTORING WATER-SOAKED MOTORS and other electric equipment to service in fast time after immersion due to flood may become highly important to war production in the next few months. Temporary batteries of heating lamps have proved highly successful in meeting such emergencies, drying as many as 100 small and fractional-horsepower motors in 24 hours. In one installation set-up following a recent flood, two racks of thirty 250-watt lamps were employed, with small fans at the ends of the drying area to increase air circulation.

BIG BOMBERS FLY FARTHER when pilots have exact, minute-by-minute knowledge of their remaining fuel supply. This knowledge is now made possible by a new liquid-level transmitter just developed by G.E. The fuel level in each tank is indicated by the position of a float in a vertical tube. A spiral guide cut in the tube rotates the float. Rotation of the float-shaft, in turn, is transmitted to the instrument panel by a selsyn system. The narrow cylindrical shape of the new unit makes it practical for use in deep tanks.

HEALTH PROTECTION FOR WORKERS assigned to remote or difficult-to-heat locations, such as a guard tower, is made easier by the use of G-E forced-convection electric heaters. Rated from 2 to 15 kv, the heaters are available in both suspension and portable types. By eliminating the necessity of running steam lines to out-of-the-way points, the heaters contribute to wartime conservation.



IN PRECISION LATHE WORK, a possible source of error in "setting the cut" is reduced by a pilot-light indicating method, developed by a foreman at G.E.'s Schenectady Works. Initial contact between the tool and the work closes a 6-volt, pilot-light circuit, thus telling the operator exactly when to set his "depth of cut" dial at zero. Formerly, close observation under a magnifying glass was required to see when the tool just touched the work.

YOUR ENGINEERS serving industry and other users of electric energy have an important war job to do in helping to make the most of our power resources. Electrical ideas such as these, though sometimes minor in themselves, can add up BIG when widely applied—frequently saving energy, man power, and critical materials. General Electric is ready to assist in the cause of conservation by supplying further information or application aid wherever better electrical utilization can help to win the war. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

Electrical World

NEWS ISSUE

Volume 119, Number 7 February 13, 1943

Canada's Giant Hydro Power Plant Revealed

Shipshaw project, final stage of Aluminum Company of Canada's power development in northern Quebec, has ultimate capacity of 1,200,000 hp. — With first two stages 2,040,000 hp.

The heavy hand of the censor, which had lain for more than two years on one of Canada's biggest wartime construction projects, was lifted recently with publication of the news that one of the world's largest hydro-electric projects, the Shipshaw development of the Aluminum Company of Canada, had begun to generate power. Surpassing Boulder Dam, and even rivaling the long-projected St. Lawrence River project in magnitude, the three stages of Shipsaw will have an ultimate potential installed capacity of 2,040,000 hp.—more than 20 percent of the total installed power capacity of all Canadian hydro at the turn of the year.

Final Stages at Saguenay

Pushed to virtual completion through two bitter winters in northern Quebec, Shipshaw required an army of 10,000 men and a payroll which has come close to the $2,000,000-a-month mark to bring it to its present stage. Designed and financed entirely by the Aluminum Company of Canada, the project is located on the Saguenay River in Quebec province.

The Shipshaw development is the final, and largest, phase of a three-stage power plan, started in 1925 with the completion of the Isle Maligne plant at the outlet of Lake St. John. The second stage consisted of the Chute-a-Caron dam and power house, located near by, built in 1929-1930, which will now serve its original long-range purpose as the first stage and standby power source of the Shipshaw development as a whole. Chute-a-Caron and Shipshaw will have a combined maximum capacity of 1,500,000 hp. The two represent a combined total outlay of nearly $106,000,000. The completed Shipshaw and the original Isle Maligne power house, considering Chute-a-Caron as a standby and reserve plant, will have an effective installed capacity of more than 1,700,000 hp. and a firm power yield of 1,445,000 hp. Thus, the Saguenay plants outrank the power plants at Niagara Falls, on both the Canadian and American sides, which have a gross installed capacity of 1,485,000 hp. and a firm power rating considerably less.

SHIPSHAW LOCALE—The Shipshaw project of the Aluminum Company of Canada is located on the upper reaches of the Saguenay River, in northern Quebec Province. Lake St. John, the water supply for the development, is a reservoir 400 miles square (map courtesy Toronto *Globe & Mail*)

The first two units of the Shipshaw power house went into operation last November, and on February 1 No. 3 generator began to produce. The generators, rated at 85,000 hp., are now actually producing 95,000 hp. and later improvements are expected to step them up to 100,000 hp., so that at present Shipshaw is producing 285,000 hp. The completed Shipshaw power station will consist of twelve generators giving a total installed capacity for the single plant of 1,200,000 hp.

Two Earlier Stages

Before the present Shipshaw development was started all power from the Saguenay was developed by the two earlier plants—Isle Maligne and Chute-a-Caron. The former was completed after the Saguenay River was dammed to maintain Lake St. John at its spring flood level of 400 square miles. Its installed capacity is now 540,000 hp. Chute-a-Caron's original capacity was 260,000 hp. from four generators rated at 65,000 hp. each. Last spring, however, the plant was stepped up to 430,000 hp. by improvements which increased output of the generators to 75,000-hp. and by an extension to the power house, in which two new 65,000-hp. units were installed. Combined output, therefore, of Isle Maligne, Chute-a-Caron and the three operating units of the Shipshaw power plant is 1,225,000 hp. and actual production has recently run over 1,100,000 hp. The remainder of Shipshaw's generators are scheduled to go into production at the rate of one a month. Two of Shipshaw's units will be the generators now operating in Chute-a-Caron's extension.

While the ultimate installed capacity

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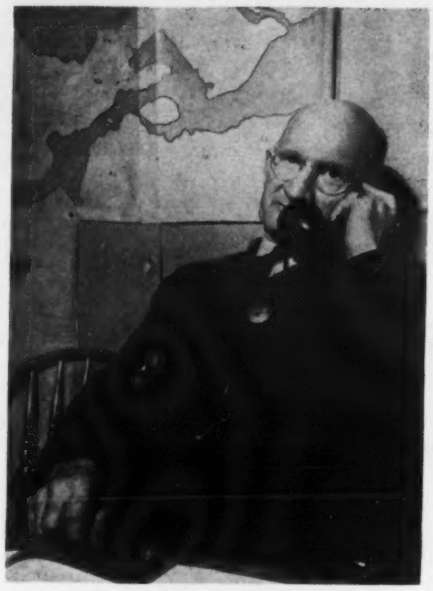
of Boulder Dam is 1,835,000 hp., its present installed capacity is 975,000 hp., with a capacity of 1,240,000 hp. scheduled by the end of 1943. This compares with the 1,200,000 hp. capacity of the Shipshaw power plant alone. Combined with the two other stages of the giant Saguenay development the ultimate capacity will be 2,040,000 hp. Boulder's capacity will come from 17 generators in two power houses, compared with twelve in one structure at Shipshaw. On a firm power basis Shipshaw is estimated from 970,000 to 1,000,000 hp., Boulder at 650,000 to 700,000 hp. Total cost of Boulder Dam is estimated at $140,000,000 (exclusive of the $65,000,000 All-American Canal). Shipshaw dam and power house and the allied water storage dam at Passe Dangereuse cost $105,700,000.

Incredible Difficulties Surmounted

It would take pages to recite some of the incredibly difficult engineering feats that went into the construction of the canal from Lake St. John, the dam and the power house. The canal was cut through rock and earth 300 feet wide, 33 feet deep and 1½ miles long to a height of land 230 feet above the river, which spills down through six penstocks which carry the water from the headblock to the power house turbines. The headblock at the downstream end of the canal is built of concrete and has twelve steel headgates to control the flow of water. At the foot of the power house it was necessary to cut back into the Saguenay again at a tidewater point downstream. All that remained between the tailrace of the Shipshaw power house and the river was a thin rock barrier 300 feet long. This "plug" was drilled and loaded with 83,000 pounds of dynamite. One shot fired the entire mass.

Constructing the storage dams at Lake Manouan and Passe Dangereuse, on the headwaters of Lake St. John, called for more feats. To build the Manouan dam in some nine months nearly 1,000 men and 2,000 tons of freight had to be flown in. Even horses had to be chloroformed and flown to the spot—one coming to unexpectedly and kicking a hole in the bottom of the plane. Temperatures ranging from zero to 30 below were the rule rather than the exception throughout the winter months. Excavated material froze in the trucks and mixed concrete had to be heated to high temperatures, rushed to the job and poured before it congealed in the trucks. At Passe Dangereuse dam, now under construction to provide additional storage for Shipshaw, 60 miles of special truck road had to be constructed through the



SHIPSHAW ENGINEER—A. O. "Paddy" Hawes, resident engineer on the Shipshaw project, is a Virginian who has been in charge of many construction jobs for the James B. Duke interests. He has been in Canada since 1923 working on various utility projects

northern wilderness. In all some 60 men lost their lives building the vast project.

Directing genius behind the development was North Carolina-born McNeely Dubose, head of the Aluminum Company of Canada's power department. His able lieutenant and resident engineer in charge of construction at Shipshaw was A. O. "Paddy" Hawes, a Virginian, who directed construction of Duke University and, since 1923, has been in Canada superintending the building of Isle Maligne and the Beauharnois power canal near Montreal. He was also in charge of building the $10,000,000 Kingston aluminum plant. At Passe Dangereuse R. F. Ogilvy was the resident engineer in charge.

Canadian Materials Used

Actual building of the project was undertaken by the Aluminum Company of Canada, which financed the $66,000,000 Shipshaw project out of contracts for aluminum with the United States and Great Britain. Contract for construction went to the Foundation Co. of Canada in the Shipshaw job, while at Passe Dangereuse the general contract was alloted to Dufresne Engineering Co. Canadian Allis-Chalmers and S. Morgan Smith Canada, Ltd., built the turbines; generators came from Canadian General Electric and Canadian Westinghouse; transformers from Canadian G. E. and English Electric Co. of Canada; Canadian Westinghouse built the control equipment and switchboard. Output of Shipshaw is carried to Arvida, site of the aluminum plant, on twelve transmission lines of 154,000 volts each.

NEWS BRIEFS

MORE THAN 970 TONS OF SCRAP was routed into war production by Southern California Edison in 1942. Scrap iron and steel totaled about 1,227,390 pounds. In their scrap hunt, Edison men went far afield. In the high Sierras near Florence Lake, for instance, they found 612,000 pounds of scrap iron and steel in old railway flat cars, tunnel dump cars and steel rails. The equipment was used years ago to help build a big hydro-electric power development.

OF 35 MUNICIPALITIES distributing TVA power, Memphis was the largest investor in War Savings Bonds, with investments amounting to $241,000 up to October 31, according to the agency. Total investments by municipalities and co-ops rose to $1,200,000 by that date.

FOR THE FIRST TIME in their history employees of the Georgia Power Co. went through an entire year without a single fatal accident, according to P. S. Arkwright, president, who made public the 1942 record.

BRITISH ENGINEERS have found that the draught of a plow can be reduced as much as one-third by putting a negative charge (from the tractor battery or generator) on the mold board of the plow. It seems to draw moisture to the breast of the plow and lubricate the surface.

GENERAL ELECTRIC'S River Works at Lynn recently assembled a 5,400-kw. turbine-generator propulsion unit for the U. S. Maritime Commission in five days. The best previous time was thirteen days and the average time has been 24 days. Three-shift operation by the regular force was employed. Work began on a Tuesday morning and the following Saturday the unit left the plant on its way to a Southern shipyard.

THE SITE OF Virginia Electric & Power Co.'s new $7,000,000 power station on the James River in adjacent Chesterfield County will be named Wheelwright, for the late Thomas S. Wheelwright, former president, according to Jack G. Holtzclaw, president.

THE TICKLISH JOB of replacing a broken runner in No. 2 generator at Jordan Dam was begun recently by the Alabama Power Co. The 29,000-kva. unit has already been dismantled and the operation called for considerable equipment and ingenious methods, according to company officials.

States' Rights Issue Stirs Power Pool Row

Jurisdiction of FPC in interstate rate case bitterly challenged by Arkansas commission — Little Rock hearing on rates charged DPC aluminum plant closes without decision at end of fifth week

The fifth and final week of the Federal Power Commission's investigations into the rates charged by the Southwest power pool for service to the Defense Plant Corp.'s Lake Catherine aluminum plant was highlighted by charges by J. A. Lasley of the Arkansas Department of Public Utilities that the FPC had no jurisdiction in the matter and that its hearing constituted an invasion of states' rights. On denial of Lasley's motion that the evidence gathered at the hearing on the rates charged by the Arkansas Power & Light Co. to the aluminum plant be stricken from the record, on the grounds that it was intrastate commerce, Lasley declared that the Arkansas commission would invite every state regulatory agency in the country to join with it in opposing the encroachment of the federal body on the state's jurisdiction and rights.

Commission Files Statement

In a prepared statement, Lasley pointed out that the intervention of the Arkansas commission was not filed in the interests of any of the companies involved, nor was it interested in the controversy between public and private power advocates. Its sole interest, he said, was in preventing undue interference with the war effort and in preventing any usurpation of states' rights.

"The order instituting this investigation, issued September 1, 1942," the statement said, "specifically limited the investigation to those matters within the jurisdiction of the Federal Power Commission. Since exclusive jurisdiction to regulate rates to Arkansas consumers, whether they be war plants or not, is vested in the Arkansas department and not in the Federal Power Commission, the department construed the order as applying only to the interstate transmission and sale of power to the Arkansas Power & Light Co. by the other pool members and that there would be no attempt to inquire into the rate for the sale by the Arkansas company to the aluminum plant . . .

"While the department concedes that the Federal Power Commission has exclusive jurisdiction of the rates at which the pool members supply power in interstate commerce to the Arkansas Power & Light Co. for sale by it to the aluminum plant, that commission has no jurisdiction whatever of the rate at which the latter company supplies power to the aluminum plant. Yet, notwithstanding this absolute lack of jurisdiction, much of this hearing has been devoted to inquiring into matters which have no relation whatever to the interstate rates involved, but which only concern the rate at which the Arkansas company is serving the aluminum plant . . ."

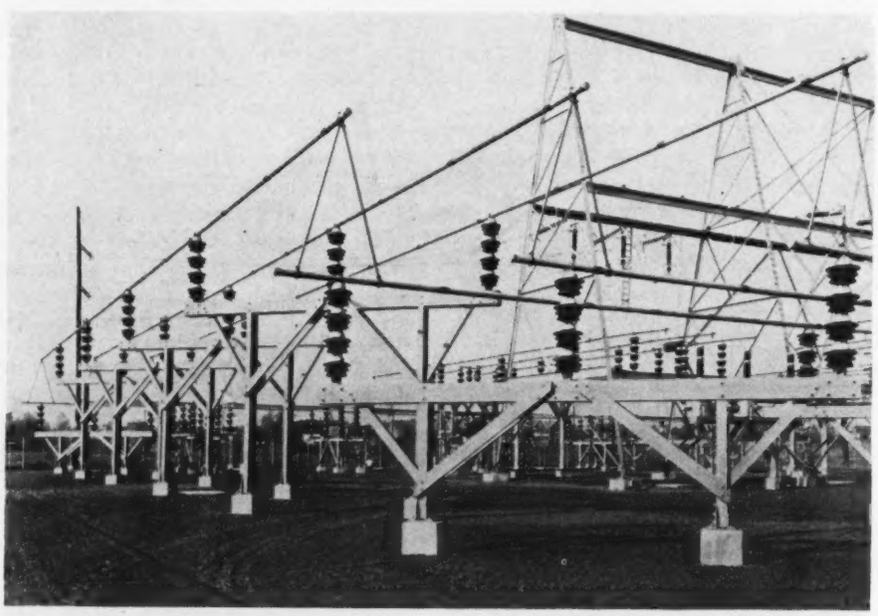
Lasley further reported that the Arkansas commission's staff had investigated the reasonableness of the rates charged the aluminum plant and had made a comparison with the rates of the Ark-La co-operative for similar service. The commission was following, he said, a suggestion by Leland Olds, FPC chairman, to the effect that an efficient way of measuring the reasonableness of rates of private companies was a comparison of its rates with publicly owned or financed agencies. After such a comparison was made, he said, the commission came to the conclusion that the rates charged by Ark-La were too low. A subsequent check by the Arkansas commission convinced it, he added, that the Arkansas Power & Light Co. will actually lose money on its contract with the Defense Plant Corp., should it be required to amortize a substantial portion of its investment in special facilities out of the revenues received under the contract.

Rules Comparison Out

However, as in previous attempts to introduce into the hearings a comparison of rates charged by Ark-La with those of the Arkansas utility, Frank A. Hampton, chief trial examiner for the FPC, refused to permit the evidence to be placed in the record.

"You could scarcely find two companies where all the material factors and the conditions were substantially similar as to make a mere comparison of rates of any substantial evidenciary value," he declared. "Each case ought to be determined fairly and correctly on its own facts, its own costs, its own operations, its own facilities, and it would not support or condemn a rate charged by one company to show that a similar rate, or one higher or one lower, was charged by another company."

Mr. Lasley's statement was followed by that of J. E. Flanders, chief engineer of the Arkansas commission, who testified that revenue derived by the Arkansas utility from the aluminum contract would fall $57,467 short of an amount sufficient to amortize cost of



SPEAKING OF SUBSTITUTION—Custom built to save forty tons of critical steel, a switching station recently constructed for Public Service Electric & Gas Co. of New Jersey, employed 30,000 board feet of lumber to replace the galvanized steel framing commonly used in this type of construction. The structure consisted of two outdoor substations—a 132-kv. section and a 26-kv. section. In the former the steel supports for switches and buses have been entirely replaced with wood, and in the latter, seen above, wood beams were used in connection with steel columns

special facilities, pay for energy generated and other expenses. The utility, he said, would receive $931,798 from DPC over the two-year period of the contract and the venture would cost the company $990,265.

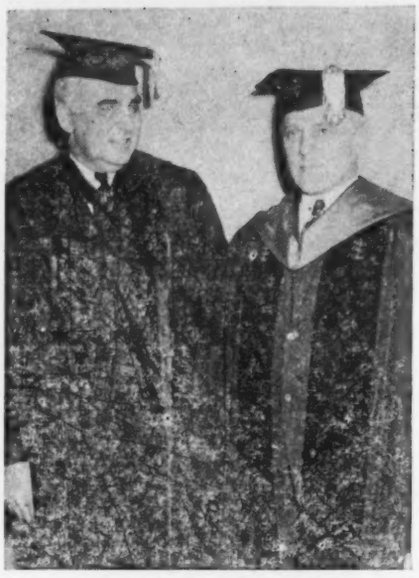
FWA Testimony Given

Prior to the intervention statement of the Arkansas commission, Douglas Wright, manager of the Grand River Dam project for the Federal Works Administration, testified that a 1 mill per kw.-hr. rate reduction given the Ark-La co-operative in power it purchases from Grand River had not been passed on to the DPC's aluminum plant. Ark-La has a contract for 32,500 kw. of demand at 92 percent load factor, which totals about 22,000,000 kw.-hr. monthly. The rate reduction of 1 mill per kw.-hr. would total about $22,000 monthly for Ark-La, or about $260,000 a year, and yet these savings were not passed on to the government, he declared.

He further testified that a tentative arrangement had been made for the Grand River Dam project to take over and operate the $4,000,000 transmission line which Ark-La built to serve the aluminum plant from Grand River Dam. This would be done, he said, as soon as the present operation of the line is changed over from 110,000 volts to 154,000 volts. All the power Grand River Dam could generate could be transmitted to the aluminum plant, he added, through the lines of the Southwest power pool. He suggested further that Ark-La's demand be raised from 32,500 kw. to 36,000 kw. at 100 percent load factor. This would reduce the pool demand from 40,000 kw. to approximately 30,000 kw., he said, and result in a saving to the aluminum plant of $15,100 a month. Closing his testimony, he urged that the power pool and Ark-La agree to a mutual utilization of their facilities to render emergency standby service for each other to prevent such "intolerable situations" as occurred during two recent Ark-La outages.

Other Witnesses Testify

Earlier in the week L. R. Lefferson, New York rate expert, testified for the power pool and got into frequent and violent controversy with Lambert McAllister, FPC attorney, who sought to re-enter the question of original cost in discussing rate bases. Another witness, John Thornborrow, rate analyst for the Middle West Service Co. of Chicago, added a new word to the hearings in his discussion of "components" of firm power, coined to describe each company's contribution to the pool's supply of firm power to the plant. Both sides referred frequently to the "Thornborrow exhibit," in which the power pool seeks to show that the ten companies involved have an investment of $230 per kilowatt for the power supplied the aluminum plant.



CHAMPIONS OF TECHNOLOGY — Addressing the graduating class of M.I.T. recently, Paul V. McNutt, chairman of the War Manpower Commission, seen with Karl T. Compton, M.I.T. president, stressed the critical importance of engineering education to a United Nations victory in this mechanized war. It is the government's policy, he said, to foster the training which will provide our armed forces with technical talent. President Compton emphasized the immediate contributions of the engineering schools to the war effort

At the conclusion of the Little Rock hearing it appeared that the already voluminous record would be considerably expanded before a decision was made. Pool counsel Eugene P. Locke of Dallas was granted permission to argue the case orally before the FPC in Washington; chief trial examiner Hampton said he would make a recommendation to the commission, and Mr. McAllister said he would seek to have the case reopened for the purpose of admitting evidence from the FPC itself and the Defense Plant Corp., owner of the Lake Catherine aluminum plant, if such evidence was deemed necessary to complete the record.

Climax of the hearing, however, which had been planned as purely a rate case developed into what may be a national issue of state's rights. The Southwest Utilities Commissioners Committee adopted a resolution urging the National Association of Railroad and Utilities Commissioners to intervene in the case on the grounds that the FPC had overstepped its bounds and was threatening the local autonomy of the states. A number of other state commissions evidenced their concern with statements that they would join in the fight and the press of the Southwest began to pound the editorial drum with the demand that federal intervention in local matters cease.

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C.E.O.C. Compiles Utility Jobs List

An unofficial title-by-title comparison of the original and the revised Occupational Bulletin No. 9, listing utility jobs which are eligible for draft deferment (ELECTRICAL WORLD, February 6, page 57) has been completed by the Council of Electric Operating Companies after consultation with War Manpower Commission officials. Copies of the comparison are being sent by the council to all utilities having 4,000 or more meters and copies may be secured upon request to the organization's Washington office (324 Homer Bldg.).

Few Classifications Eliminated

The new Bulletin No. 9 is considerably condensed in numbers of job titles from the original one, but the comparison shows that only a handful of classifications have been entirely eliminated —for instance, service or work dispatcher, oiler, oil purification operator, stockkeeper. Several completely new categories have also been added, such as audit accountants, training program instructor, radio technician.

Most important deletion is the withdrawal of occupational deferment consideration from department heads and assistants in non-operating departments such as taxes, rates, legal, etc. This is in line with WMC's over-all policy which is being applied to all industries, explained in a letter from Col. Stocking, associate director of WMC Bureau of Program Planning and Review, to Council President Tom Walker. The letter says, in part:

"These occupations have been irrevocably excluded from other lists of essential occupations. . . . The exclusion . . . should not be constructed to mean that the committee does not consider these occupations important; however, it felt that it could not extend occupational coverage to workers in these phases who are of military age. Manpower needs for the armed services permitted of no other action . . ."

Bulk of the changes in the new list represent consolidations of several job titles under a broader single heading. For instance, nine "engineer" titles in the original list now are covered under three classifications.

Use of CMP Procedure on Metal Needs Urged

Deliveries of aluminum, steel and copper for construction during second quarter will be made first to holders of CMP allotment numbers in addition to priority ratings

Utilities should begin to use the Controlled Materials Plan machinery on their aluminum, steel and copper requirements for construction (not maintenance) projects where deliveries are scheduled after April 1. The manner for integrating CMP mechanisms into existing priority procedures involving construction is outlined for utilities in an administrative letter being mailed to all companies by WPB's Power Division.

Advantage in initiating use of CMP procedure now is that deliveries of the three controlled materials during the second quarter will be made first to holders of CMP allotment numbers in addition to priority ratings. After June 30 deliveries will be made only on CMP allotment numbers.

Utilities Use Form CMP-4C

The only CMP form applicable to utilities is Form CMP-4C. It should be used for obtaining quantities of controlled materials from mills and dealers, but not for material to be obtained from a company's own or another utility's excess stocks. Form CMP-4C is used in addition to, and for all projects requiring WPB Forms PD-200 (large construction), PD-1A (small construction), PD-545 (housing), or P-46 letter application. It is the Power Division's intention to prepare the CMP forms for utilities in cases involving PD-1A and P-46 letter application, but until this machinery is set up utilities should do their own paper work.

It is advisable that utilities prepare at once CMP-4C's for projects which already have been authorized by WPB but which require controlled material deliveries after April 1. Form CMP-4C is prepared for projects hereafter approved upon receipt of the construction authorization in reply to a PD-200, PD-545, etc., application.

Specify Amounts Required

In preparing the forms, utilities specify the amounts of controlled materials required from suppliers in each month after March. It is necessary also to specify the amounts of material needed by manufacturers to fabricate equipment carrying a CMP Class A product listing, and the months in which the materials are needed by the fabricator. For instance, a utility project calling for a steam engine (a Class A product) in November, 1943, might require plates and bars for the manufacturer in July and August and billets for the forge shop supplying the manufacturer with forgings (also a Class A product) in May.

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Release Surplus Farm Line Copper

Until April 1 utilities may use "surplus" stocks of copperweld-copper and amiductor wire in construction of urgent rural electric "power-for-food" farm extensions previously authorized under terms of Supplementary Order P-46-c (ELECTRICAL WORLD, January 16, page 5).

Application for use of frozen stocks is to be made by the utilities to WPB by letter, stating (1) that the extension conforms to the specifications of P-46-c, (2) the amount and kind of conductor to be used and (3) the reasons why the extension cannot be deferred.

The copper-steel conductor may only be used with specific WPB permission granted in individual cases, where reasons can be shown why construction of an extension should not be delayed until steel wire is available. The original P-46-c limited extensions to steel wire primaries, but adequate stocks are not available during the first quarter. WPB has allocated steel to wire mills for the manufacture of wire for this rural lines program and this stock is expected to become available in the second quarter.

Where steel wire is available, rural construction within the limits of the order may still proceed without Washington approval.

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Honor Utilities Advertising Campaign

The institutional advertising of the electrical utilities was honored recently at the annual Advertising Awards dinner, sponsored by *Advertising and Selling* magazine, with the medal award for association advertising. The award went to the advertising agency responsible for the series, N. W. Ayer & Son, Inc.

TRIPLE "E" FOR FAIRBANKS-MORSE—During the past month three Army-Navy "E" pennants have been awarded to plants of Fairbanks, Morse & Co.—at Beloit, Wis.; Freeport, Ill., and Three Rivers, Mich. Ceremony at Beloit was the biggest and the principals are shown above. Left to right: Rear Admiral E. L. Cochrane, USN, chief of the Bureau of Ships; Commander J. M. Hicks, USN, resident naval inspector; Lieut.-Col. John N. Gage, U.S. Army, who presented the pins; A. C. Howard, general manager of the Beloit works, and Col. Robert H. Morse, president and general manager of Fairbanks, Morse & Co.

House Bill Attacks SEC "Death Sentence"

Legislation designed to bring about active consideration by Congress at this session of the issue of suspending or repealing the disintegration provision of the Holding Company Act was introduced in the House of Representatives this week.

The measure (H.R. 1746), sponsored by Congressman Evan Howell, Illinois Republican, authorizes wartime suspension of the Holding Company Act "death sentence." As such, the bill is a duplicate of that sponsored in the last session by another Illinois Republican, Congressman George A. Paddock, which failed to reach a vote.

Meanwhile, the independent offices supply bill, sent to the House by the appropriations committee, would reduce the SEC appropriation for 1944 by 16 percent. The budget bureau had recommended a total SEC appropriation for the 1944 fiscal year of $4,798,000, or $112,000 below the $4,910,000 made available for the 1943 fiscal year, but the committee called for a further reduction to $4,048,000. This amount was $862,000 below last year and $750,000 under the budget proposal. "Reduced activity in the financial world" was the main reason given for the slash.

Congressman Howell introduced his bill, he said, to provide a basis for discussion before the Securities and Exchange Commission subcommittee of the interstate and foreign commerce committee of the whole question of the "death sentence." He said he thought it possible that as a result of subcommittee consideration a measure for outright repeal of the breakup feature of the act might be reported to the floor for a vote. But either a suspension or a repeal bill should get a floor vote at this session because of the importance of the issue, he asserted.

Public hearings on his bill will be called when the committee can schedule them, the Congressman said, perhaps, in a month or six weeks. He is a member of the SEC subcommittee. Meantime, a companion bill may be introduced in the Senate.

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OPA Further Defines Rate Increases

A formal interpretation from the Office of Price Administration this week holds that increases in utility rates resulting from automatic adjustment clauses based upon increased taxes, fuel costs and similar items are subject to the 1942 anti-inflation act.

Effect of the ruling is to require that before instituting any rate increases under adjustment clauses utilities must give 30 days advance notice to OPA and consent to intervention by OPA before the regulatory agency with jurisdiction if the government objects. Initiative for action to halt or delay the increase, however, lies with OPA and the revised rates may be put into effect after 30 days if no intervention has been taken.

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P. G. & E. to Spend $21,400,000 in 1943

Plant Construction to Be Held to Projects Under Way

Pacific Gas & Electric Co. will spend approximately $21,400,000 for system improvements in 1943, according to its construction budget recently released. Expenditures for new and improved facilities in 1942 amounted to approximately $30,000,000, a reduction of some $9,600,000 from the original estimate because of wartime curtailment.

Generating plant construction in 1943 will be confined to projects already under way. It is expected that the Dutch Flat hydro plant will be completed in April, Oleum No. 2 steam plant by July and the four units of Pit No. 5 during the latter part of the year, proposed additions from these three plants during 1943 totaling 237,500 kva.

The reconstructed Hat Creek reservoir will furnish 6,000 kw. of additional dry year peak capacity and another 25,000 kw. will become available in the spring from the reconstructed Bakersfield steam plant. The steam plant is one of two which the company obtained permission to rehabilitate as a means of utilizing sources of power that could be made available in a minimum of time and with a minimum of critical materials.

Principal item of transmission construction in 1943 will be for facilities to absorb power from Pit No. 5 on the Pit River. This work has been scheduled with a view to material shortages and the only addition to existing 220-kv. lines will be a 14-mile tap from the power house to a junction with the present Pit-Vaca lines at Round Mountain.

A capacitor station consisting of 25,200 kva. of static capacitors with necessary accessories will be constructed during the year to supplement energy being provided by the city of San Francisco to an aluminum reduction plant.

Distribution construction during the year will be dependent upon expansion in industrial plants and other projects related to the war effort. Commercial and industrial customers are now taking 63 percent of the electric energy sold by the company.

Finished '42 Program

Despite curtailment, P.G.&E. completed the most essential parts of its 1942 program, principal deferment being the 75,000-kva. Midway steam plant at Buttonwillow. The 50,000-kva. No. 1 unit at Oleum steam plant was connected into the system in January, 1942, and was in full operation by March; the 11,000-kva. hydro plant at Upper Narrows on the Yuba River was placed in service during December. Construction of Pit No. 5 project was advanced materially during the year.

A total of 116,350 kva. of substation transformer capacity was added to the company system last year.

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WPB Fights Shift in "Wartime"

The full weight of WPB influence has been thrown against campaigns in both Michigan and Ohio to "secede" from the effects of national War Time through state legislation shifting the areas from Eastern to Central time zones. Local relief from hour-early clocks through exemptions from War Time or state legislation would, WPB Chairman Nelson contends, "inevitably be followed by similar action by other states, resulting inevitably in great confusion and detriment to the work of war production." Georgia has already switched from Eastern to Central Time.

In taking a firm stand against lifting War Time, Nelson offered one potential "out" for the two states when he agreed not to oppose action by the Interstate Commerce Commission transferring the states to Central Time Zone if the ICC, after investigation, finds the area "is in fact logically a part" of that zone.

Studies made by WPB's Power Division released with Nelson's statement estimate that War Time had cut utility peak loads 100,000 kw. in Michigan and 15,000 kw. in Ohio, and had "saved" 115,000,000 and 100,000,000 kw.-hr. a year respectively in the two states. While he said WPB "is deeply appreciative of the difficulties caused by fast time," Nelson explained that the savings accruing from it have been "highly important to the war effort" and should be retained.

Public Opposes Utility Take-over in Northwest

Washington-Oregon poll shows residents 2-1 against Columbia Power Administration authority to buy or condemn properties and 4-1 for postponing any change for the duration

Residents of the Columbia River power area in Washington and Oregon are more than four to one in favor of postponing until after the war any change in the Pacific Northwest power set-up and giving the proposed Columbia Power Administration authority to buy or condemn power companies. They are more than two to one against such a program in any circumstances. This was revealed recently with the publication of a survey conducted scientifically by Daniel E. Clark II and Associates, made last fall for four power companies—Washington Water Power Co., Puget Sound Power & Light Co., Pacific Power & Light Co. and Northwestern Electric Co.—when the Bone-Smith bill was before Congress. It has been anticipated that the bill will be reintroduced in the present session.

Favor Local Decision

Other highlights of the survey showed that opinion in the two states is more than eleven to one in favor of the public ownership question being decided by vote of the local communities affected instead of by Congress. The "Front-Door Ballot Box" samples showed 83.7 percent for local decisions, as against 7.5 percent for Congressional action and 8.8 percent "undecided." The study also found that, by a five to one margin, the people in Washington and Oregon consider their present electric rates reasonable.

Direct interviews with a representative cross-section of the people in the two states revealed that only 13.7 percent were favorable to making a change in the Northwest's power set-up now. In contrast, 63.3 percent said they believed any change should be postponed until after the war. Twenty-three percent expressed no opinion.

Basic question asked in the survey was: "Do you think this proposed Columbia Power Administration should or should not be given authority to buy or condemn and take over every electric power company in Washington and Oregon." The division showed 24.0 for the proposal, 46.1 percent against it and 29.9 percent expressing no opinion. Opinion in Washington, which has many PUDs organized, paralleled that in Oregon, where the people have been slow to form such districts. Even the minority approving the take-over idea returned a 51.9 to 36.1 percent majority for postponing action for the duration.

Rural residents are as much opposed to giving the Power Administration take-over authority as citizens of the two states generally, according to the tabulation. This group was 24 percent for and 46.1 percent against the proposal, with 29.9 per cent expressing no opinion. Areas in which PUDs have been organized but are not yet operating were also within a few tenths of one percent of the over-all results for the two states. Seattle, which has competing city-owned and private electric systems, likewise was close to the general pattern, with 22.5 percent and 43.5 percent against the take-over idea, and 34 percent expressing no opinion.

Of the occupation groups, strongest opposition to the take-over idea was registered by white-collar workers, only 11 percent of whom favored the proposal, as compared to 56.6 percent opposed and 32.4 percent who expressed no opinion. Professional and business people were 25.3 percent for and 53.9 percent against the proposal, with 20.8 percent expressing no opinion. Farmers and farm laborers, excluding non-farm rural residents, were 31.8 percent for and 46.7 percent against the proposal, with 21.5 percent no opinion. Classified by occupation groups, laborers, constituting nearly half the sample, also opposed the proposal with 22.8 percent for and 44.6 percent against, and 32.6 percent expressing no opinion.

Breakdown by incomes shows the lowest income group divided 22.4 percent for and 43.1 percent against the proposal, with 34.5 percent expressing no opinion. The middle income group was 25.6 percent for, 46.5 percent against, and 27.9 percent no opinion. In the upper bracket the division was 21 percent for, 56.1 percent against, and 22.9 percent no opinion.

Study on Initiative No. 12

Closely related to the survey on public opinion on the public ownership question in the two states is an analysis released by the same four power companies on "Initiative to the Legislature No. 12." Petitions on the initiative, sponsored by the State Grange, and designed to broaden the already liberal public utility district code of the state, are nearly sufficient in number to compel the Washington Legislature to act. The bill, if rejected by the Legislature, will go to the voters at the next general election. It proposes to permit PUD commissioners to join by areas into super-commissions, and by groups of super-commissions into "super-super authorities" to take over and operate power utility properties. The voters would have practically no check on these proposed authorities, according to the bill.

SCOUT TROOP SPONSORED—Boston Edison Employees Club sponsors a Boy Scout troop at Dorchester, Mass., and the company tenders the use of its auditorium in its general service buildings there for the weekly meetings. This club maintains a cabin for the use of the troop at Scoutland, Westwood, Mass., where the late R. S. Hale, former head of the special research department, devoted much of his time to these interests after his retirement

A.I.E.E. Nominates Funk for President

Nevin E. Funk, vice-president in charge of engineering of the Philadelphia Electric Co., has been nominated for president of the American Institute of Electrical Engineers, succeeding Harold S. Osborne, American Telephone & Telegraph Co., to take office August 1, 1943.

Other official candidates of the A.I.E.E. national nominating committee, who will be voted upon by the membership at the coming election this spring, include the following:

Vice-Presidents—For the middle eastearn district, W. E. Wickenden, president Case School of Applied Science, Cleveland; for the southern district, C. W. Ricker, professor and head of School of Electrical Engineering, Tulane University, New Orleans; for the north central district, L. A. Bingham, assistant professor of electrical engineering, University of Nebraska, Lincoln, Neb.; for the Pacific district, J. M. Gaylord, chief electrical engineer Metropolitan Water District of Southern California, Los Angeles; for the Canada district, W. J. Gilson, general manager Eastern Power Devices, Ltd., Toronto, Ont.

Directors—C. M. Laffoon, engineering manager a.c. generator engineering department, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.; C. W. Mier, engineer Southwestern Bell Telephone Co., Dallas, Texas; S. H. Mortensen, chief electrical engineer Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

National treasurer—W. I. Slichter, professor emeritus, electrical engineering, Columbia University, New York.

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Wisconsin Led War Bond Drive Parade

Wisconsin utilities led all others during the nation-wide war bond drive last December.

Data gathered by the Council of Electric Operating Companies showed that 99.4 percent of all utility employees in Wisconsin subscribed an average of 7 percent of their pay for bond purchases. Ten of the 15 participating companies reported 100 percent enrollment.

Best individual performance was that of the Wisconsin Power & Light Co., all of whose employees subscribed an average of 13.8 percent of the gross payroll for bonds. L. F. Seybold of the Wisconsin Electric Power Co. headed the utilities division of the state war savings staff.

Elsewhere, incomplete returns show that of the companies qualifying for minute man flags, denoting 90 percent employee participation, six companies showed pledges totaling at least 10 percent of the payroll and 30 more reported pledges of more than 7 percent.

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Correction

In the January 30 issue of ELECTRICAL WORLD, page 9, under the title "Whisker Extensions for Farms Seen as War Aid," it was incorrectly stated that the speech of P-46 administrator Paul Vallee was read to the delegates of the National Rural Electric Co-operative Association, at their convention in St. Louis, January 19–20. The speech was delivered instead to the Food-for-Victory conference of the Rural Electrification Administration, sponsored by the federal agency, which followed the NRECA meeting, also in St. Louis.

MEETINGS

Pennsylvania Electric Association — Transmission and distribution committee, Fort Stanwix Hotel, Johnstown, Pa., February 18-19; hydraulic power committee, P.E.A. headquarters, Harrisburg, Pa., February 25; electrical equipment committee, Roosevelt Hotel, Pittsburgh, Pa., February 25-26. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

American Institute of Electrical Engineers—Northeastern District, Wendell Hotel, Pittsfield, Mass., April 8-9; Southwestern District, Kansas City, Mo., April 28-30; National Technical Meeting, Cleveland, Ohio, June 21-25. H. H. Henline, national secretary, 33 W. 39th St., New York, N. Y.

Previously Listed

American Society for Testing Materials—Committee week and spring meeting. Hotel Statler, Buffalo, N. Y., March 1-6. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

Southeastern Electric Exchange—Engineering and Operation Section, Henry Grady Hotel, Atlanta, Ga., March 25-26. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, Ga.

Electrochemical Society — Spring meeting, Hotel Roosevelt, Pittsburgh, Pa., April 7-10. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

Midwest Power Conference—Palmer House, Chicago, Ill., April 9-10. Stanton E. Winston, conference director, Illinois Institute of Technology, Chicago, Ill.

Missouri Association of Public Utilities—Annual business meeting, Elms Hotel, Excelsior Springs, Mo., April 16-17. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

National Electrical Manufacturers Association — Spring meeting, Palmer House, Chicago, Ill., April 20-23. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

North Central Electrical Industries—Annual all-industry conference, Radison Hotel, Minneapolis, Minn., April 26-27. Wm. A. Ritt, secretary-manager, Foshay Tower, Minneapolis, Minn.

American Society of Mechanical Engineers — Spring meeting, Hotel Black Hawk, Davenport, Iowa, April 26-28; semi-annual meeting, Hotel Biltmore, Los Angeles, Calif., June 14-16. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

Missouri Valley Electric Association—Annual engineering conference to be held in conjunction with meeting of 7th District American Institute of Electrical Engineers, Continental Hotel, Kansas City, Mo., April 28-30. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln, Neb.

REA Asks Help on Standards

The Rural Electrification Administration will welcome any manufacturer's suggestions for improving REA technical standards, consolidating two or more standards into one, reducing cost without impairing service, increasing the reliability of service even at extra cost, introducing new standards that would reduce cost, and simplifying design or making competent substitutions of materials. Such suggestions, according to M. M. Samuels, chief, Technical Standards Division, should be submitted to D. H. Mackay, head Distribution Systems Section, Technical Standards Division, REA.

The message, addressed to manufacturers engaged in the production and distribution of materials used in rural electrification, pointed out that there is no conflict between the interests of reputable manufacturers and those of the REA. Cooperation of REA engineers with those of manufacturers is to the benefit of both, the announcement said. Unless there is good reason to the contrary, REA accepts the standards, rules and regulations of such national bodies as the American Standards Association, the various national engineering societies, the National Electrical Safety Code and the National Electrical Code, it is declared.

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16-Week Lighting Course in Chicago

A sixteen-week free course in practical elementary illumination, sponsored by the Illinois Institute of Technology and the Chicago Lighting Institute under the U. S. Office of Education's War Training Program, will start in Chicago February 24. The course is open to men and women within and without the lighting industry who have direct or indirect contact with the field.

Basic requirements for admission are a high school education or equivalent and an elementary knowledge of alternating current and direct current and employment in a war industry. Tuition, as stated, is free.

Advisory committee for the course includes: J. E. Hobson, P. G. Andres and F. A. Rogers, Illinois Institute of Technology, and L. V. James, General Electric Co., Chicago; R. G. Raymond, Commonwealth Edison Co.; G. K. Hardacre, Public Service Co., of Northern Illinois, and C. W. Zersen of the Chicago Lighting Institute. Instructor will be John Harrington, Commonwealth Edison Co., Chicago.

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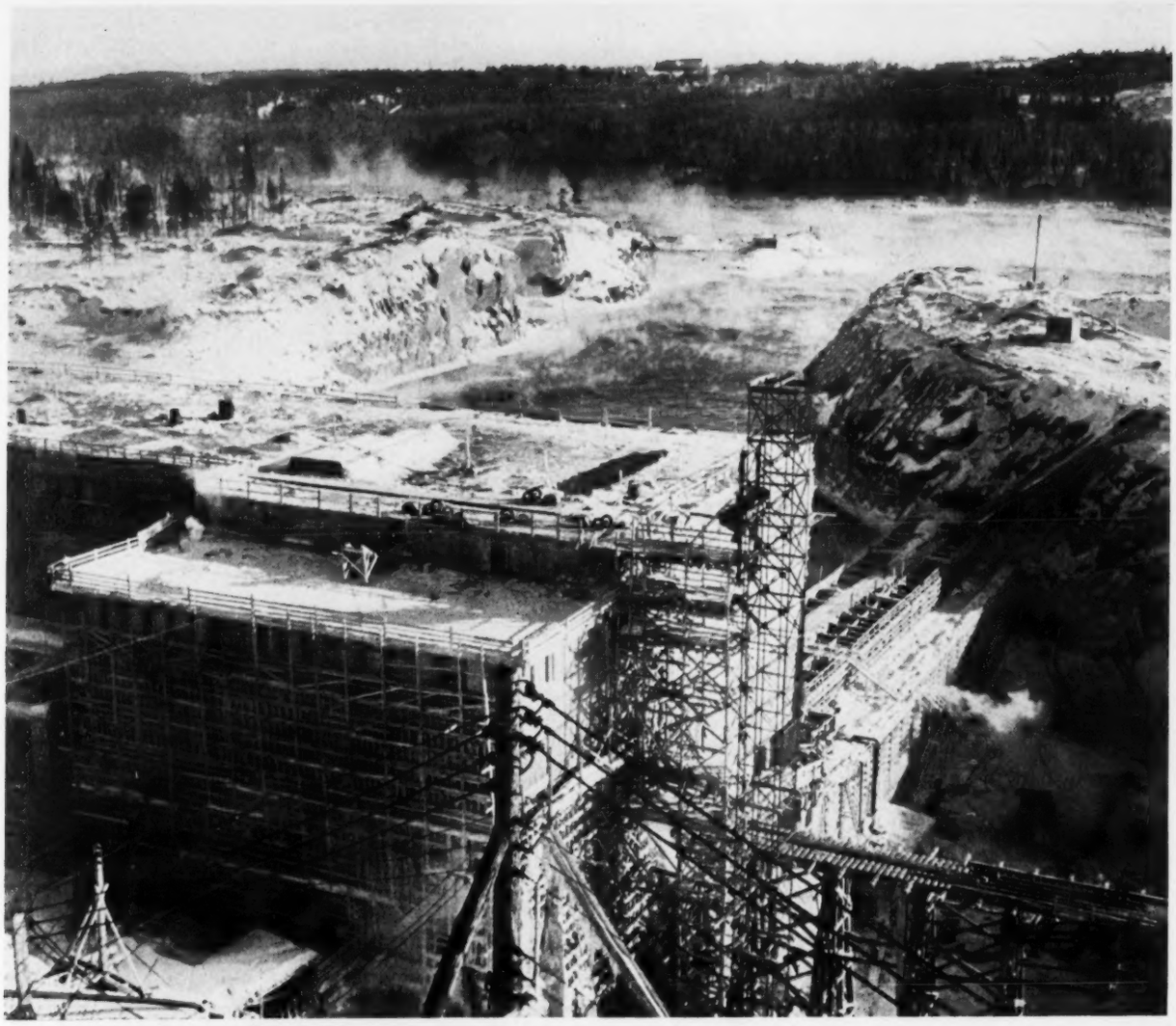
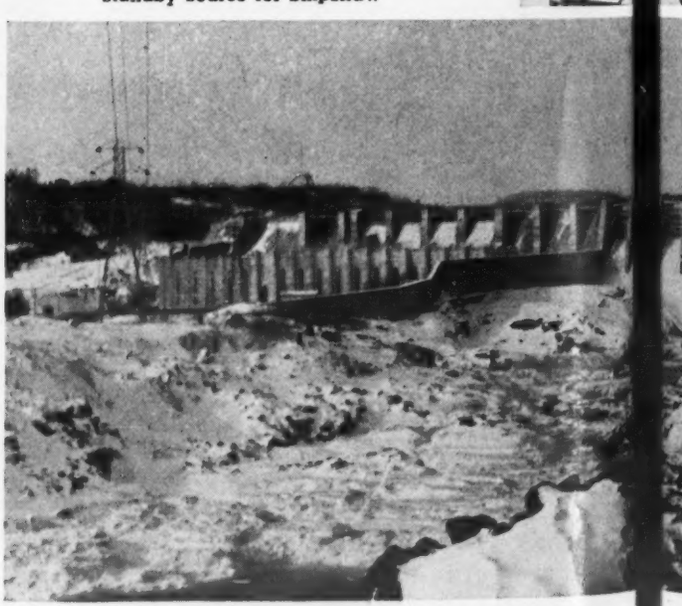


No. 1 power house of the Shipshaw project has now been completed and two of its generators are producing power; picture shows tailrace leading into powerhouse

Six of these mammoth tunnels bore through 800 ft. of rock to upper canal; workmen are shown checking for leaks

Chute-a-Caron power house and dam—second stage of Shipshaw project now furnishing Aluminum Company of Canada with 390,000 hp. It will serve its original purpose as first stage and standby source for Shipshaw



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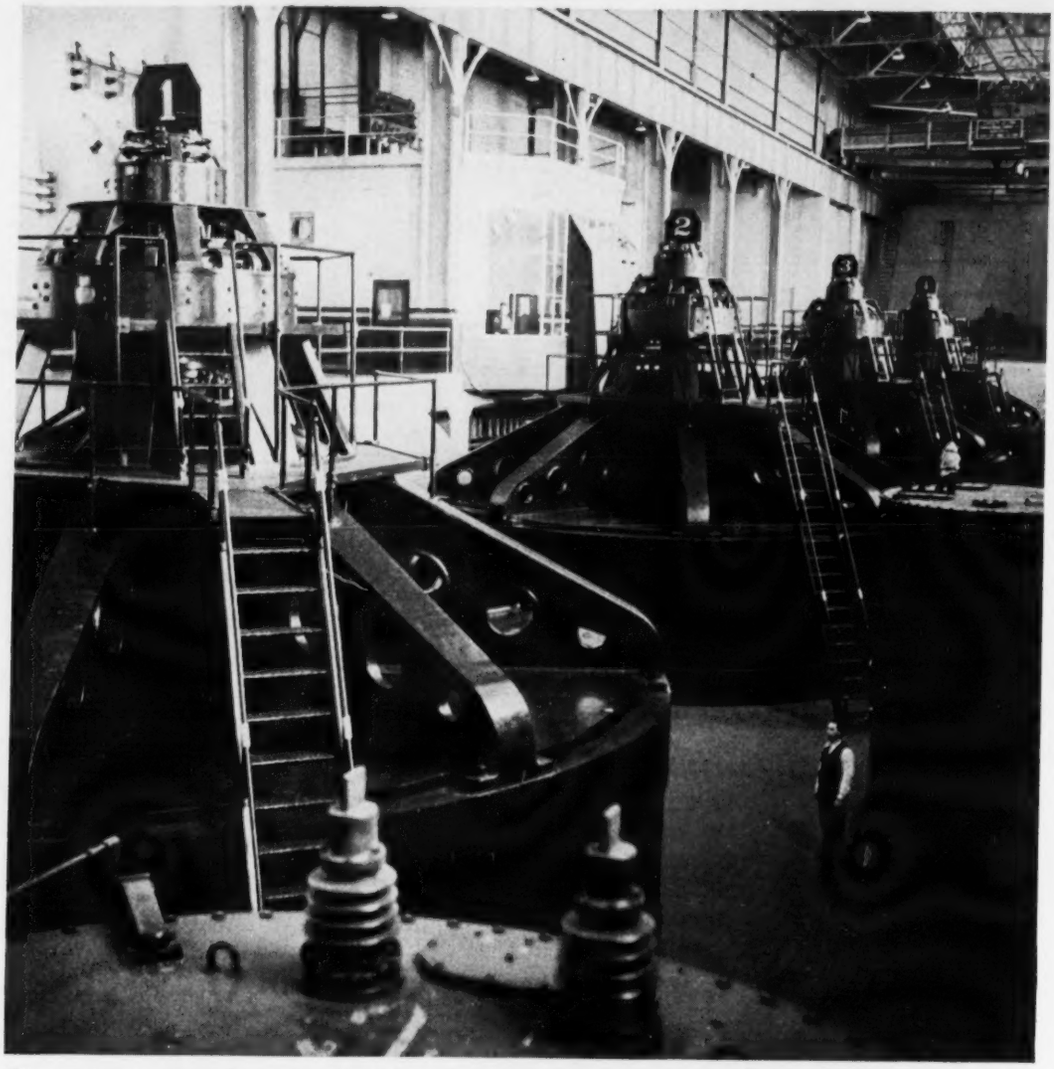
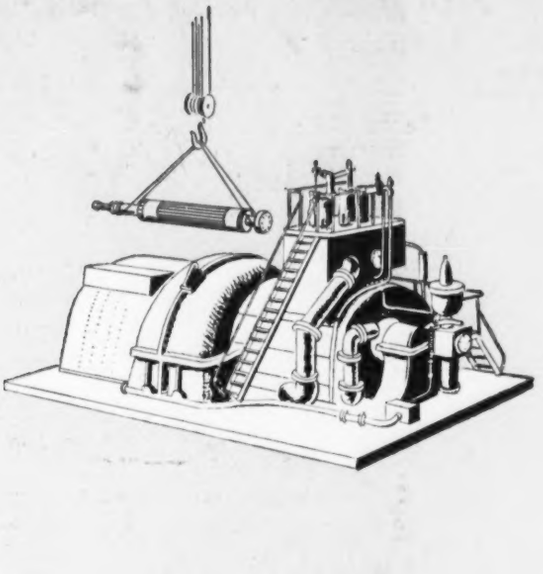


View in No. 1 power house of the Shipshaw development; two of the twelve generating units are now in operation and, by midsummer, all of its units should be producing power

Forty-four power shovels and cranes, 525 trucks and 67 tractors were used to excavate 7,300,000 cu.yd. of rock and earth

MORE KILOWATTHOURS FOR VICTORY



62% MORE KW!
44% MORE KV-A!

. . . gained by modernizing an old turbine

A western utility demonstrates that, for increased capacity, it pays to look first to your present equipment. An old 25,000 kv-a, 80% power-factor turbo-generator was increased to 36,110 kv-a, 90% power factor—an increase of 62% in kw rating and of 44% in kv-a.

The generator output was increased by various improvements to get greater thermal capacity. Losses were reduced by the use of nonmagnetic material in vent duct spacers, through-bolts, and end spacers. Ventilation of end turns was improved and new blowers were installed. Stator copper was increased by punching larger slots in the old iron and rewinding. More field copper was added to the rotor by machining deeper coil slots and rewinding.

The turbine output was increased by slight changes in design. The blading needed replacement. New modern blades and nozzles were supplied which helped increase the output.

With a minimum use of critical materials, sorely needed extra capacity, not obtainable in any other way, was provided.

This is typical of the work now being done by Westinghouse field and engineering service. Similar rehabilitation and modernization may be a solution to some of your problems. Our engineers will be glad to give you full co-operation and immediate attention. Just phone our nearest office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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Output Curve Recedes Slightly

A slight improvement last week in the generally overcast weather which has been prevailing for nearly a month brought a slight drop to the output curve, which has been maintaining an unseasonal rise. The amount of electrical energy distributed by the light and power industry for the week ended February 6 showed 3,960,000,000 kw.-hr., as compared to 3,976,844,000 kw.-hr. the week previous and 3,974,202,000 kw.-hr. for the week of January 23. The latest week's output figures are 14.0 percent over those for the corresponding week in 1942—about the same level of increase which has been maintained since the first of the year, according to the Edison Electric Institute.

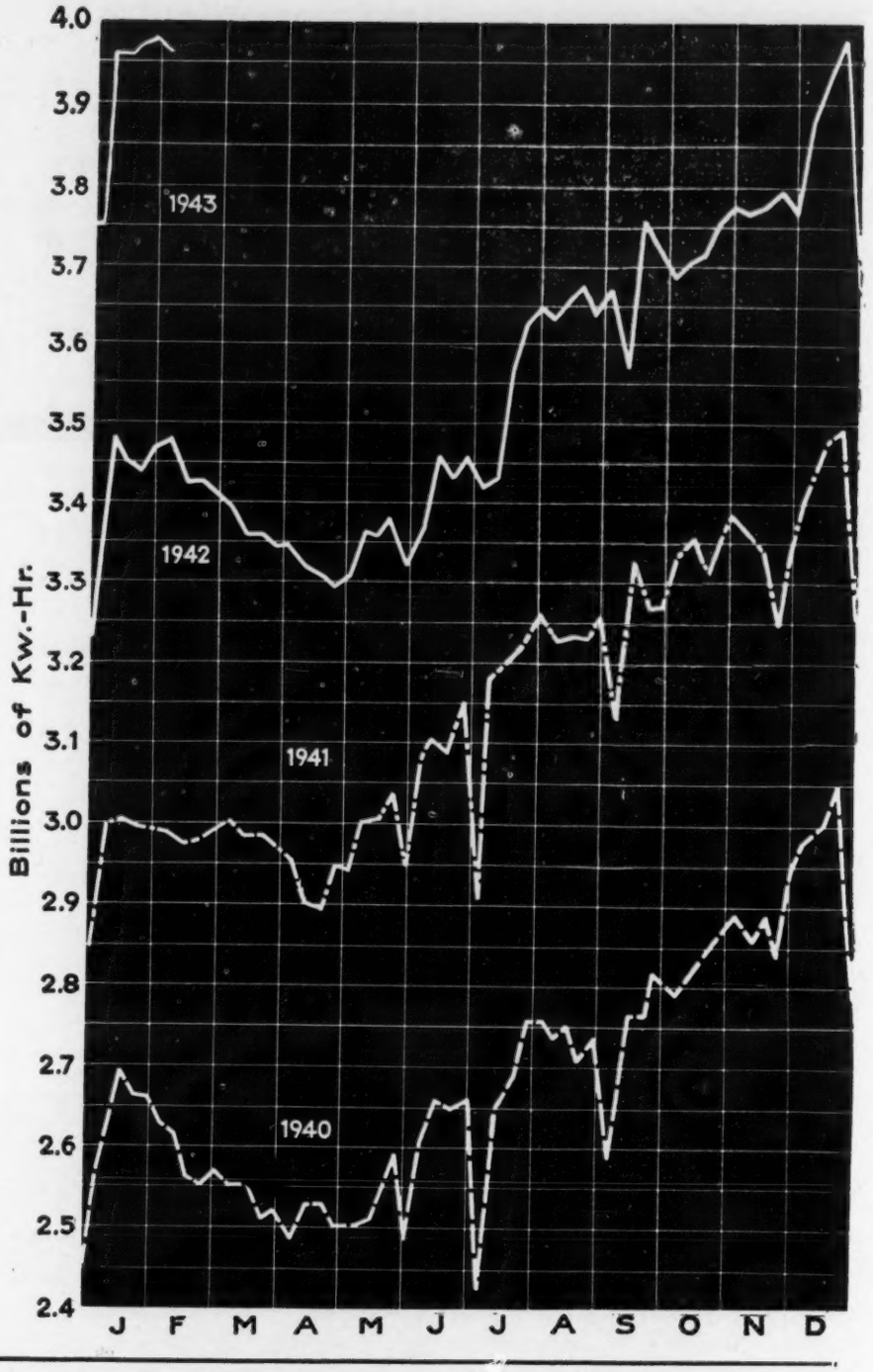
All of the major geographic divisions of the country showed a slight falling off in the percentage of increase over last year, compared to the week previous, with the exception of the Pacific Coast region and the Southern states. Both these regions continue to lead the country in percentage increase over the '42 figures, the former with 29.9 percent and the latter with 20.4 percent.

Weekly Output, Millions Kw.-Hr.

1943		1942		1941	
Feb. 6	3,960	Feb. 7	3,475	Feb. 8	2,989
Jan. 30	3,977	Jan. 31	3,468	Feb. 1	2,994
Jan. 23	3,974	Jan. 24	3,440	Jan. 25	2,996
Jan. 16	3,952	Jan. 17	3,450	Jan. 18	3,013
Jan. 9	3,952	Jan. 10	3,472	Jan. 11	3,002
Jan. 2	3,780	Jan. 3	3,289	Jan. 4	2,816
1942		1941		1940	
Dec. 26	3,656	Dec. 27	3,234	Dec. 28	2,757
Dec. 19	3,976	Dec. 20	3,495	Dec. 21	3,052
Dec. 12	3,937	Dec. 13	3,476	Dec. 14	3,003
Dec. 5	3,883	Dec. 6	3,415	Dec. 7	2,976

Percent Change from Previous Year

	Week Ending		
	Feb. 6	Jan. 30	Jan. 23
New England	+ 3.1	+ 3.6	+ 7.0
Mid-Atlantic	+ 5.1	+ 7.7	+ 9.6
Central Industrial	+11.8	+12.2	+12.6
West Central	+15.0	+15.6	+14.3
Southern States	+20.4	+20.1	+21.2
Rocky Mountain	+12.3	+13.8	+11.0
Pacific Coast	+29.9	+29.6	+30.6
Total United States...	+14.0	+14.7	+15.5



North American Adds 30 Percent Capacity

Near completion of a large emergency construction program, increasing the system's generating capacity by more than 30 percent, was announced recently by the North American Co. A total of $123,700,000 has been spent since 1939 on property additions, principally for new power plants and equipment, according to Edward L. Shea, president, and the 1943 expenditures will approximate $25,000,000 to bring the program to completion, the announcement said.

The program called for an outlay of $39,600,000 in 1942, $52,100,000 in 1941 and $32,000,000 in 1940. the statement said, and an increase in the system's generating capacity of about 41 percent, or 634,000 kw., bringing total capacity to 2,640,030 kw., in order to meet the ever-increasing demands of war production. Scaling down of the 1943 construction budget conforms to the plans of the War Production Board, the statement said, and releases some equipment, including a 50,000-kw. generator and an 80,000-kw. generator which had been ordered for Washington and St. Louis, respectively.

The system's expansion, since 1939, includes an increase of 185,000 kw., or 27 percent in the Union Electric Co. and subsidiaries of St. Louis; 170,000 kw., or 33 percent, in the Cleveland area by the Cleveland Electric Illuminating Co.; 150,000 kw., or 59 percent, by Potomac Electric Power Co. of Washington, D. C., and 129,000 kw., or 24 percent, in the Milwaukee area by Wisconsin Electric Power Co. and subsidiaries.

Aggregate electric power output of the Cleveland, St. Louis, Milwaukee and Washington companies in the North American system amounted to 10,500,000,000 kw.-hr. in 1942, an increase of 13.8 percent over their output in 1941.

NEWS ABOUT PEOPLE

Ebasco Services Elects Two Vice-Presidents

T. C. Westcott, engineering manager, and Harold H. Scaff, controller, have been elected vice-presidents of Ebasco Services, Inc., service organization for the Electric Bond & Share Co. system.

Mr. Wescott has been identified with the Bond & Share system since 1911 and Mr. Scaff since 1922.

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▶ J. B. PORCHER, safety director of the Ohio Edison Co., Akron, Ohio, has been named chairman of an executive committee to establish a safety council in Akron.

▶ DR. R. S. JANE has been appointed head of the recently organized industrial research department of the Shawinigan Water & Power Co. Dr. Jane, who was formerly associated with Shawinigan Chemicals, Lt., holds a post-graduate doctorate degree from McGill University.

▶ KENNETH L. HAMPTON, assistant manager of the Valley Electrical Supply Co. of Fresno, Calif., has been named to head OPA's recently enlarged Central California District. Mr. Hampton has been associated for 20 years with Valley Electrical Supply, a merchandising subsidiary of the San Joaquin division of Pacific Gas & Electric Co. He is president of Supplier's, Inc., dealing in retailers' supplies, and has been active in consumer and credit associations.

▶ STORRS M. BISHOP has been appointed resident manager of the New York Power & Light Corp. at Albany. Mr. Bishop has been connected with New York Power & Light since his graduation from Union College in 1926 and has been manager of the Hudson district for the past six years. He first served in the Schenectady district, but in 1930 was transferred to Glens Falls, where he was engaged in power sales activities. In 1933 Mr. Bishop was appointed resident manager of the Port Henry area and three years later was transferred to Hudson.

▶ CHARLES F. BLAKE, attorney for the Tampa (Fla.) Utility Board, has been made secretary of the board as well.

▶ RALPH W. PENDLETON of the Massachusetts Safety Council, Boston, has been appointed safety director for the Grinnell Co., Providence, R. I. He was guest of honor at a dinner on February 4 by the engineering section of the council, Frank Morris, vice-president in charge of engineering, Liberty Mutual Insurance Co., Boston, presiding.

▶ JOHN M. FRANK, president of the Ilg Electric Ventilating Co., Chicago, has been elected president of the National Association of Fan Manufacturers.

▶ RAYMOND S. MCKEOUGH has been appointed OPA regional administrator in Chicago to succeed John C. Weigel, resigned. Mr. McKeough was formerly a member of Congress. His new assignment includes the states of Illinois, Wisconsin, Iowa, Nebraska, Minnesota, North Dakota, and South Dakota.

▶ E. J. BECKETT, financial assistant to President J. B. Black of Pacific Gas & Electric Co., has been appointed treasurer of the California utility, according to an announcement by Black. Beckett joined P. G. & E. in 1915 as secretary to the late A. F. Hockenbeamer, who at that time was vice-president and treasurer of the company. In 1920 he was made assistant treasurer. When Hockenbeamer became president Beckett was made his financial assistant, a position he has occupied continuously since that time, serving in the same capacity for President Black. D. H. Foote, who has acted as secretary-treasurer for the last 15 years, will continue in his capacity as vice-president and secretary. Foote is also a director.

Applegate Assumes New Duties in Hartford

Kenneth P. Applegate, general manager of the Hartford Electric Light Co., has been elected a vice-president. He will continue in his former post, with two titles combined.

Raymond A. Gibson, lately assistant commercial manager of the Hartford company, and more recently assistant superintendent of its Dutch Point steam plant in responsibility, has been appointed assistant to vice-president R. D. Cutler, who has general executive charge of commercial developments. L. H. Knapp continues as commercial manager.

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▶ WILLIAM J. THOMAS, manager of mechanical tube sales of the Babcock & Wilcox Tube Co., Beaver Falls, Pa., has been appointed assistant general sales manager of the company. Mr. Thomas, who was formerly with the process equipment division of the Babcock & Wilcox Co. at Barberton, Ohio, was transferred to the executive department of the sales offices of the Babcock & Wilcox Tube Co. in 1941.

▶ B. C. COOPER has been appointed acting chief of the lighting and fixtures section, building materials division, of the War Production Board to succeed MARSHALL N. WATERMAN, who has been transferred to the position of assistant director in the Building Materials Division. Mr. Cooper has been with the lighting and fixtures section since April, 1942. Prior to that he worked in the mechanical engineering section of the Public Buildings Administration, Federal Works Agency, where he was assigned to the illumination group designing and specifying lighting equipment for federal buildings. He previously had many years experience in the lighting fixture industry.

In his new position Mr. Waterman will supervise the activities of the lighting and fixtures section as well as three other sections in the Building Materials Division. The priorities unit in the lighting and fixtures section is now under the direction of DAVID H. MASON, who joined the section about two months ago. Mr. Mason was previously a partner in the Architectural Lighting Co. of Chicago, Ill.

▶LEO EDELSON, for the past ten years development engineer for Handy & Harman, has joined the Induction Heating Corp., New York, as executive vice-president.

▶CHARLES MCKEW PARR, chairman of the board of Parr Electric Co. and national authority on distribution in the electrical wholesaling industry, has been elected chairman of the recently formed distributor's war service committee. This committee has been set up on a national basis. Its purpose is to facilitate the government in procuring and routing material for war goods production. Mr. Parr was formerly senior electrical consultant for the distributor's division of the War Production Board, but recently resigned that position upon his election to the Connecticut State Assembly. This new committee has announced that it will work in close cooperation with the War and Navy departments and will be available to all governmental agencies and departments as a general clearing house.

OBITUARY

▶R. L. MILLICAN, for 30 years connected with the city electric department, Jacksonville, Fla., died on January 28 in that city, following a brief illness. He was 60 years old. At the time he retired, in 1941, Mr. Millican was assistant superintendent of the overhead distribution system of the electric department.

▶ARTHUR J. PARTRICK, credit executive for the past fifteen years of the Ingersoll-Rand Corp., New York, died suddenly at his home in Ridgewood, N. J., on January 31, in his fifty-fifth year.

▶WILLIAM KENNEDY, one of the earliest hydraulic engineers in Canada, died at his home in Montreal on January 31, in his ninety-sixth year. He had retired in 1925. In the course of his career, Mr. Kennedy engaged in the design and construction of some of the most important hydraulic and hydro-electric plants in the Ottawa district and various other parts of Ontario, Quebec and the Maritimes. Mr. Kennedy was a member of the Engineering Institute of Canada.

▶S. P. LARSEN, southern California district sales engineer for Hubbard & Co. for the past nine years, was killed instantly January 2 in an automobile accident near Riverside. Born in Neenah, Wis., in 1899, he began his career in the electrical industry with the Wisconsin, Light, Heat & Power Co. at Appleton. Later he became manager of Line Material Co. in the Southern states. Transferring to the Pacific Northwest, Mr. Larsen represented Line Material in Oregon, Washington, Idaho, Montana and British Columbia. In 1927 he joined the Hubbard organization as Northwest manager, removing to southern California in 1931.

▶JOHN H. QUINLAN, 39, an electrical engineer with the Potomac Electric Power Co., Washington, D. C., for the past 13 years, and formerly on the engineering staff of the New Haven Railroad, died suddenly in Washington on February 4. He was a native of Utica, N. Y.

▶ANDREW J. O'REILLY, retired construction engineer of St. Louis, Mo., died on January 27, in his eighty-first year. Mr. O'Reilly was graduated from Washington University, St. Louis, in 1888. He served as supervisor of city lighting from 1900 to 1903, engineer of the St. Louis Fire Prevention Bureau during the World's Fair in 1904 and president of the Board of Public Improvements from 1905 to 1909. He then became a consultant for the Laclede Gas Light Co. and the Union Electric Light & Power Co. Later he was made superintendent of plant construction for the Mississippi River Power Distributing Co., safety engineer on the National Board of Fire Prevention and a member of the Missouri Public Service Commission, serving from 1921 to 1925.

▶TIMOTHY J. LYNCH, who retired about three years ago, after more than 25 years' service as New England district manager for the Allis-Chalmers Manufacturing Co., with headquarters at Boston, died at his home in that city on February 2. He was a native of Greenland, N. H., and in his earlier career spent about 15 years in the company's plants at Milwaukee, Wis., and Toronto, Canada. He had been identified with many important steam and hydro-electric plant developments in the northeast, including water supply projects and diversified equipment applications.

▶THEODORE A. WILLARD, inventor and retired president of the Willard Storage Battery Co., died on February 3 at his home in Beverly Hills, Calif. He was 80 years old. A native of Castle Rock, Minn., Mr. Willard spent more than 30 years in inventing devices for storage batteries. He held 65 patents in this work. After retiring several years ago as president of the Willard organization, which has its main office in Cleveland, Mr. Willard moved to Beverly Hills and devoted much of his time to exploration in Yucatan.

HONORS FOR THE PRESIDENT—C. F. Hood, left, president of American Steel & Wire Co., accepts a 25-year silver U.S. Steel Corp. service medal from John May, vice-president and general manager of sales of the wire company. Mr. Hood started in 1917 as an operating clerk in Worcester, Mass. He became president on January 1, 1938

MANUFACTURING-MARKETS

SEC Releases Survey On Manufacturers

The Securities and Exchange Commission last week made public the tenth of a new series of industry reports of the Survey of American Listed Corporations. The latest report includes companies engaged primarily in the manufacture of electrical supplies and equipment other than household appliances. The reports cover the calendar years of 1940 and 1941 for companies with fiscal years ending in the same calendar year, and extend earlier reports which generally covered the period 1939-1940.

The 31 corporations comprising the group include:

Cable Electric Products, Inc.; Century Electric Co., Clark Controller Co., Connecticut Telephone & Electric Corp., Curtis Lighting, Inc., Cutler-Hammer, Inc., Duro-Test Corp., Electric Controller & Mfg. Co., Electrical Products Corp., Emerson Electric Mfg. Co., Gamewell Co., General Electric Co., A. C. Gilbert Co., Harvey Hubbell, Inc., Kellogg Switchboard & Supply Co., Leland Electric Co., Line Material Co., Master Electric Co., Nestle-LeMur Co., Noma Electric Corp., Ohio Brass Co., Penn Electric Switch Co., Philadelphia Insulated Wire Co., Potter Co., Reliance Electric & Engineering Co., Sangamo Electric Co., Sonotone Corp., Square D Co., Wagner Electric Corp., Westinghouse Electric & Mfg. Co., and the Weston Electric Instrument Corp.

Single copies of the report may be obtained from the SEC publications unit at Philadelphia, Pa.

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Noma Reduces Dividend

Noma Electric Corp. has announced a dividend of 25 cents a share, comparing with 35 cents paid in March last year. The corporation has recently leased the six-story and basement building, containing about 45,000 sq.ft., at 21 to 25 West Twentieth Street, New York, for storage purposes.

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Formica Gets "E" Award

The Army-Navy "E" award for production achievement was presented on February 6 to the Formica Insulation Co. at ceremonies held in Music Hall, Cincinnati, Ohio. Presenting the "E" pennant to D. J. O'Conor, president of the company, and three employee representatives chosen by the workers, Col. Alonzo M. Drake, Detroit, Army Air Force Central District procurement supervisor, complimented the labor-management co-operation.

Lighting Equipment Curb Recommended

"One way in which manufacturers may assist in the conservation of scarce materials is by individually simplifying their lines—discontinuing all items except those actually needed in war goods manufacture." That is the consensus of opinion of the industrial and commercial lighting equipment section of the National Electrical Manufacturers Association, expressed at its last meeting, according to H. A. Barnes, Wheeler Reflector Co., and chairman of the section's industrial incandescent technical committee.

The committee, at the request of the War Production Board, has submitted a report which, if made effective by

KIT DEMONSTRATES HOME WIRING—The West Penn Power Co.'s Electric Home Bureau developed the demonstration kit, shown above with J. H. Cleland, staff member, to aid in customer instruction on home wiring maintenance in wartime. Field personnel of the bureau are using the kits before group meetings to dramatize the necessity of keeping home wiring in good working order

WPB, will provide for the elimination of literally hundreds of designs and sizes of industrial incandescent lighting equipment and which will assure a substantial reduction of scarce material in process.

The section has already co-operated with WPB by making recommendations for the standardization and simplification of industrial fluorescent lighting equipment lines, including reducing the number of models to bare necessity.

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Sylvania Plans for Post-War Era

Directors of Sylvania Electric Products, Inc., have declared a quarterly dividend of 25 cents a share on the common stock, comparing with four quarterly dividends of 31¼ cents a share each declared in 1942.

Announcement was made after the meeting that because of the rapid expansion of business consideration is being given to steps which may be advisable to increase working funds and to set up reserve for post-war adjustments. The program may include the sale of common stock, authorization for which may be submitted to stockholders at their annual meeting next month.

Included in the proposal under consideration is the calling for redemption of 83,896 outstanding shares of convertible preferred stock, which has a present conversion ration of 2.1 shares of common stock for each preferred share.

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Philco Corp. Arranges $30,000,000 V Loan

Philco Corporation, Philadelphia, has arranged a $30,000,000 three-year V-loan to provide additional working capital to finance its large and increasing production of electronic equipment for the Army and Navy, Larry E. Gubb, chairman of the board of directors, and James T. Buckley, president, have announced. This credit, the largest V-loan to date in the Third Federal Reserve District, is being extended by a group of 21 banks headed by the Pennsylvania Co. for Insurances on Lives and Granting Annuities, which handled the arrangements.

The credit is guaranteed to the extent of 80 percent by the War Department and has been arranged in accordance with Regulation V of the Federal Reserve System based upon the President's Executive Order No. 9112 of March 26, 1942.

Field Reports on Business

Heavy industrial centers continue to reflect a high degree of activity and it is expected that present high levels will hold. Reports indicate increased business in the electrical trade. Demand is heavy for small motor installations and supplies for lighting and power lines are moving at a good rate.

NEW YORK

The War Production Board announced this week that administration of its retail inventory limitation order, L-219, is soon to be located in New York City. According to Lewis S. Greenleaf, Jr., director of WPB's Consumer Goods Bureau, said the administrative offices of the division would be transferred from Washington within the next few weeks and would occupy the fourteenth floor of the Columbian Carbon Bldg., Madison Avenue and East 42nd Street. John A. Hurley, director of the division, will maintain headquarters at the new location.

Department store sales for the week ended January 30 remained on the same level as the corresponding week a year ago, according to the Federal Reserve Board, but the breakdown showed that New York was off 7 percent, Boston off 14 percent, Philadelphia 13 percent and Richmond 16 percent. The decreases reflected the shrinking inventories and curtailment of consumers durable goods.

Engineering construction volume for the week totaled $81,796,000, an increase of 95 percent over the preceding week, but 49 percent under the corresponding 1942 week, according to *Engineering News-Record*. The current week's total brings the 1943 construction volume to $303,622,000—53 percent below the volume reported for the six-week period of 1942.

NEW ENGLAND

Increased activity in commitments and in quotations is noted in the electrical trade. A quick step-up in the volume of small motor installations in factories in the Boston area, during the past two weeks, tripling the previous rates, indicate the opening up of small plants for war subcontracts. Supplies for lighting and power lines are moving at a good rate. Browne & Nichols School, Cambridge, Mass., has installed fluorescent lighting in a portion of its establishment; one of the largest telephone switchboards in New England is being installed in the old Houghton & Dutton Building, where changes are being made to accommodate offices of the WPB and OPA. A contract for additional facilities at a Maine airport has been awarded to S. W. Cunningham & Son, estimated at $1,929,000, which will include wiring supplies in considerable volume.

New Hampshire Public Service has purchased about 500 kva. in line type capacitors for power-factor correction at Milford and other points. A group of 455 capacitors for the Navy was recently quoted on by several manufacturers in this area. Other schedules of interest on which bids have been submitted include 2,400 hot plates, 73,000 snap switches, lighting fixtures, knife and toggle type switches, and watertight buzzers for the Navy. Massachusetts radio equipment manufacturers are active in submitting bids for vacuum tubes. Electric cables and magnet wire are in demand. A contract for supplying the Boston schools with incandescent lamps ranging from 7.5 to 1,000 watts rating has been awarded to Cooper Electric Supply Co., Inc., Boston.

Connecticut utilities report record-breaking electrical production for 1942. Hartford Electric's sales of energy during December were 12.4 percent above 1941 and Connecticut Power's advanced 20 percent. United Illuminating gained 6.2 percent and Connecticut Light & Power 7.82 percent.

CHICAGO

December business in Chicago, as reported by the Chicago Association of Commerce on February 1, staged marked advances compared with prevailing levels a year earlier. There was a rise of 25 percent in factory payrolls for the month, of 11.9 percent in department store sales. Building permits issued, however, slumped to 35 for December, 1942, from 370 for December, 1941.

Used electrical equipment dealers report the market steady to strong for January. Demand is heavy for motor-generator sets and low-voltage high-current d.c. machines and high-frequency generators in the range from 500 cycles and up. Bulk of the equipment is being ordered by steel mills, ordnance depots, and other war production industries; 94 percent are priority business.

Mail order houses and other retail outlets report a strong demand during January for table and floor lamps with lighting fixtures, ceiling and wall brackets, participating in the movement.

Additions to existing plant facilities have been undertaken recently by twelve companies, among them Ohmite Manufacturing Co., Runzell Cord & Wire, and Stewart-Warner. Since the start of the war the government has taken over 10 percent of the downtown office space for federal department transferred here.

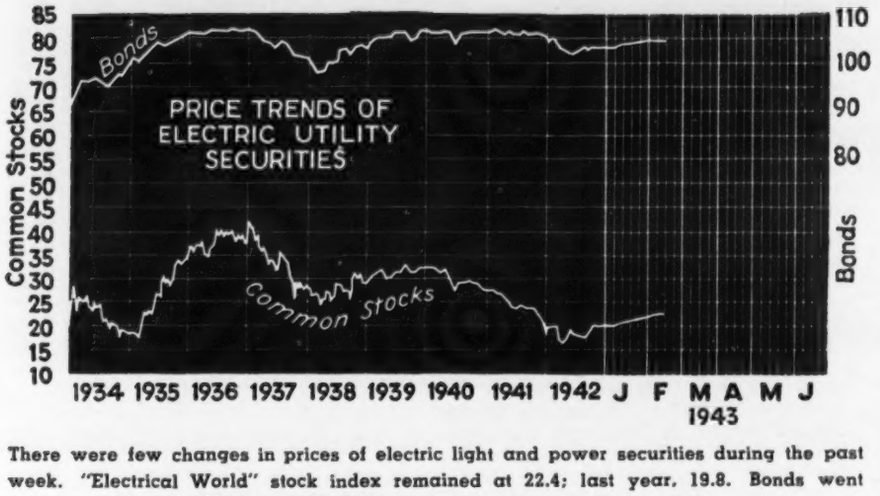
PACIFIC COAST

Westinghouse is supplying a 10,000-hp. a.c. and a 2,000-hp. d.c. motor for the $2,000,000 wind tunnel being constructed at Pasadena. More typical orders include the equivalent of a carload of schedule wiring devices for Marine Corps quarters, five carloads of poles and equivalent hardware and fittings for Signal Corps, a carload of iron tie wires for Southern Pacific, five carloads of thin wall conduit for overseas bases shipment and 60 24-in. floodlights for a Bay shipyard.

These specific orders reflect the important electrical aspect of such general awards as U. S. Engineers work, exceeding $1,000,000 at a Los Angeles County location; $2,500,000 of housing adjacent to the Tooele (Utah) munition plant and storage; a chemical warfare depot in Utah, and $500,000 additions to two California maritime academies.

An intensive government survey has been ordered in the Western states (except Utah) among small plants, especially those apparently closed for the duration, to restore them as participants in the co-ordinated manufacture of small parts. Wholesalers report an increasing standardization of former staple lines.

Utility Security Prices Change Slightly



There were few changes in prices of electric light and power securities during the past week. "Electrical World" stock index remained at 22.4; last year, 19.8. Bonds went to 104.6, from 104.5 the previous week; last year, 104.8

National Would Sell Tennessee Gas

As a further step in liquidation program, in compliance with "death sentence" provisions of the Holding Company Act, National Power & Light Co., an Electric Bond & Share Co. subsidiary holding unit, has proposed to the Securities and Exchange Commission the sale of its entire interest in West Tennessee Gas Co. to Equitable Securities Corp. of Tennessee for $712,500 in cash, plus interest at 3 percent from June 30, 1942.

National states that the transaction is a step in compliance with the SEC's order of August 23, 1941, under Section 11 (b) (1) of the act. Equitable is not an affiliate of West Tennessee, National said, or of any other utility holding company.

The commission set February 15 for a hearing on the proposal.

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North American Gas Liquidation Ordered

North American Gas & Electric Co. has been ordered by the Securities and Exchange Commission to liquidate in compliance with "death sentence" provisions Section 11 (b) (2) of the Holding Company Act. The holding company, which is the parent of Washington Gas & Electric Co. and eight other subsidiaries, was directed to proceed "with due diligence" to present a plan to carry out the provisions of the order.

In the same order the SEC withdrew the exemption which permitted the company to reacquire its own securities without specific commission approval.

In addition, the application of North American Gas for an order directing that company to surrender its investment in the common stock of Washington Gas & Electric to the trustees of the latter company, and for an order declaring that North American Gas has

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Louisiana Sale Approved by SEC

Conditional approval of the sale by Associated Electric Co. of its wholly owned subsidiary, Louisiana Public Utilities Co., Inc., to G. C. Hyde, R. A. Ritchie and D. Gordon Rupe, all of Dallas, for $3,000,000, subject to certain adjustments, has been granted by the Securities and Exchange Commission. The transaction, first announced in October of last year (ELECTRICAL WORLD, October 3, 1942, page 76) includes the sale by Louisiana of 1,010 shares of the capital stock of Atlantic Utility Service Corp. to Associated Electric Co.

Conditions imposed by the commission included adjustment of accounts of Louisiana to eliminate write-ups in the manner agreed to by Associated and Louisiana, and that Associated shall, after the sale is consummated, adjust its investment and surplus accounts.

In a separate order involving Louisiana Public Utilities the Federal Power Commission announced its order approving an application of the company which proposed the disposition, in accordance with the commission's uniform system of accounts, of $1,261,656.33, of which $528,919.74 has been classified in the company's reclassification of accounts and original cost studies in the electric plant adjustment account, and $732,736.59 in the "Other Utility Plant" account.

FINANCIAL BRIEFS

RANDOLPH PHILLIPS, holder of 1,100 shares of United Corp. common stock, is heading a group soliciting proxies from more than 100,000 stockholders of the company, in an effort to oust the present management and elect new directors at the annual meeting, scheduled for March 3 in Wilmington, Del. The group charges that since 1929 United's stockholders have suffered a loss in market value amounting to "$524,000,000, or more than 91 percent of the stockholder's original contribution." Mr. Phillips, who describes himself as a writer and financial consultant, took a prominent part in the efforts of another small group of minority stockholders, headed by Samuel Okin, New York attorney, on the occasion of the annual meeting of the Electric Bond & Share Co. to elect a new management.

UNION ELECTRIC CO. OF MISSOURI and Iowa Union Electric Co., a subsidiary, have filed joint proposals with the SEC in which Iowa Union would (a) sell to the parent company all its outstanding common stock, 8,793 additional shares of its no-par value common for $45 a share, (b) issue and deliver to the First National Bank of St. Louis its promissory note in the principal amount of $200,000, bearing interest at 2 percent and payable on demand three years from issue date, and (c) use the proceeds from the sale of the common stock and note, together with other funds, to redeem its presently outstanding bonds amounting to $700,000.

Utility Reports

	Net Income 1942	1941
*Blackstone Valley Gas & Elec.	$925,346	$954,686
*Central Illinois Light	1,359,137	1,656,014
*Commonwealth & Southern and subs	11,012,167	12,141,227
*Consumers Power	7,580,575	9,345,074
*Georgia Power	5,594,630	5,366,355
*Lynn Gas & Electric	748,458	840,873
*Mississippi Power	681,294	363,575
*Marion-Reserve Power	447,448	543,608
†Mountain States Power	657,145	701,343
*Pacific Lighting and subs.	6,645,935	6,381,716
*Pacific Power & Light	939,063	740,107
*Pennsylvania Power	650,601	814,852
*South Carolina Power	531,151	438,829
*Southern Indiana Gas & Electric	767,012	817,571

* Twelve months ended December 31.
† Twelve months ended November 30.

Illinois Iowa Sues North American Light

Illinois Iowa Power Co. filed suit in U. S. District Court at Wilmington, Del., recently against its former parent company, North American Light & Power Co. The utility, which is asking the return of more than $20,000,000 and accounting of certain transactions, charges that the holding company charged exorbitant fees and spent money improperly as the parent firm.

North American Light & Power was recently granted a six months extension by the Securities and Exchange Commission order requiring liquidation of the company. At the time of granting the extension the SEC held that it had jurisdiction to hear and determine unliquidated claims in dissolution proceedings before it—a reference to the Illinois Iowa claim (ELECTRICAL WORLD, January 30, page 20; January 23, page 132). Judge Robert E. Healy of the commission dissented from that view and remarked that he felt that "the sooner the case and its disputes as to claims gets into court the better." The Illinois Iowa suit follows that action and may result in a longer delay in the SEC proceedings against North American Light beyond the six-month grant.

The Illinois Iowa suit asks that North American Light pay over $6,000,000, plus interest for funds allegedly spent improperly in transactions with the Federal Central Terminal Co.; to account for and pay over $13,222,500 for services taken by North American Light in dividends through the Central Terminal Co., and that North American Light be enjoined from collecting $675,000 on a note of Central payable to it.

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FPC Rescinds Order No. 97

The Federal Power Commission recently rescinded its Order No. 97 (ELECTRICAL WORLD, July 11, 1942, page 72) requiring utilities to file copies of contracts covering sales of energy to government agencies or requiring government agency OK amounting to 1,000 kw. or more demand or delivery of 2,000,000 kw. hr. or more annually.

In taking the action, FPC explained that the data from utilities is no longer necessary inasmuch as the agency now received copies of proposed contracts directly from the agencies involved under the President's directive making FPC responsible for obtaining the cheapest wartime power sources.

Sales Opportunities

MASSACHUSETTS—Lawrence Gas & Electric Co., Lawrence, will make extensions in lines and install equipment and facilities for power supply at local textile plant of Pacific Mills, Worsted Division, which has contracted with company for central station service. This will replace supply heretofore secured from own power plant. Work is scheduled to be carried out at once.

ILLINOIS—Studebaker Corp., South Bend, Ind., manufacturer of automobiles, now in production for government, plans expansion in plant, including new buildings and installation of machinery and electrical equipment for large increased capacity. Cost about $11,200,000, with financing by Defense Plant Corp. Work on project will begin soon.

MINNESOTA—Construction Service, Veterans' Administration, Washington, D. C., receives bids until Feb. 23 for new buildings and complete electrical installation at institution at St. Cloud, including outside services, electric elevators, conduit lines, fixtures, wiring in structures totaling close to 1,900,000 cu. ft., and miscellaneous electrical work.

MARYLAND — Bethlehem-Fairfield Shipyard, Inc., Curtis Bay, Baltimore, an interest of Bethlehem Steel Co., Bethlehem, Pa., plans addition to power plant at one of shipbuilding plants, with installation of equipment for increased capacity.

WASHINGTON—Civil Aeronautics Administration, Boeing Field, Seattle, and Washington, D. C., is completing plans for expansion in two airports, with complete lighting equipment, electrical distribution system, control station and other facilities.

KENTUCKY — Ken-Rad Tube & Lamp Corp., Owensboro, manufacturer of radio tubes and kindred specialties, plans new plants in Kentucky and Indiana for production for government, comprising several units, with machinery and electrical equipment for large output. Cost about $1,300,000, with financing by Defense Plant Corp. Proposed to begin work soon.

OHIO—Toledo Edison Co., Toledo, plans rebuilding of power substation, recently damaged by fire, with loss reported about $50,000, largely in equipment. New circuit breakers and other apparatus will be installed.

TENNESSEE—Volunteer Electric Cooperative, Inc., Decatur, is considering extensions in transmission line for service at new manganese ore-mining development now being established by Cleveland Manganese Co., Cleveland, Tenn., including substation facilities at plant site.

RHODE ISLAND—Blackstone Valley Gas & Electric Co., Pawtucket, is planning to use tar as fuel at generating stations, instead of oil, and will carry out necessary conversion and facilities for this change at once.

NEBRASKA—Loup River Public Power District, Columbus, has approved plans for relocation and rebuilding part of 115-kv. transmission line and will carry out work at once. Cost estimated close to $40,000.

ILLINOIS—Chrysler Corp., 341 Massachusetts Avenue, Detroit, Mich., will carry out expansion in munitions plant for production for government, comprising a number of new one and multi-story buildings, with machinery and electric equipment installation for large increased output. Entire project will cost about $16,000,000 and will be financed by Defense Plant Corp. Work is scheduled to proceed at early date.

NORTH CAROLINA—Federal Works Administration, Washington, D. C., has surveys in progress for proposed development of hydroelectric power plant, initially projected as a municipal-owned station and later taken over by government. A reservoir area of about 15,000 acres of land will be provided. Generating plant is being redesigned for an increase in initial estimated capacity of 21,000 kw. Entire project will cost about $8,000,000. W. R. Holway & Associates, 302 East Eighteenth St., Tulsa, Okla., are consulting engineers; Ward D. Carpenter, FWA, High Point, is project engineer.

FLORIDA—U. S. District Engineer Office, Jacksonville, has plans maturing for new fuel oil storage and shipping terminal, including electrically operated pumping stations, distribution lines, substation and other electrical installation. Entire project will cost close to $5,000,000. Work is scheduled to be carried out soon.

UTAH—U. S. District Engineer Office, Salt Lake City, will build addition to power house at a government development, with installation of equipment for increased capacity. Award for building has been made to Paul Paulsen, 55 West First St. South, Salt Lake City. Equipment contracts will be placed separately.

MICHIGAN—Detroit Edison Co., Detroit, is arranging fund of about $5,000,000 for expansion and improvements in properties during 1943, including extensions in transmission and distributing lines, power substations and other field structures, including service facilities for new consumers, estimated at close to 20,000 for the year. Company will proceed with installation of a 75,000-kw. turbine-generator unit at one of plants, as soon as prevailing stop-order of WPB has been released. As soon as this work is resumed, about $3,000,000 will be added to budget noted for station expansion.

NORTH CAROLINA—National Carbon Co., Inc., 30 East 42d St., New York, N. Y., will carry out expansion in plants for production for government, including new buildings and installation of machinery and electrical equipment for increased capacity. Work is scheduled to begin at once. Cost about $1,450,000, with financing by Defense Plant Corp.

NEBRASKA—Cuming County Rural Public Power District, Westpoint, has secured permission from State Railway Commission to make extensions in transmission and distributing lines in six counties, totaling close to 76 miles in all, with power substation and service facilities.

TEXAS—U. S. District Engineer Office, Albuquerque, N. M., has authorized new flying field facilities at a government development, including lighting system and complete electrical installation. The entire project is reported to cost more than $300,000.

NEW EQUIPMENT

Relay

Induction-cylinder relay for generator protection incorporates a new principle called "product restraint" with variable slope characteristics. This new combination is said to eliminate difficulty previously encountered with high-speed generator relays due to the transient current transformer errors on heavy through faults. The use of this new principle, it is claimed, assures positive operation on internal faults since the restraining force in case of any single end-feed condition will be zero or negative because one of the two terms making up the product is zero.

Type "CFD" generator-differential relay, 20 5/16 x 5½ in., in 3-element drawout case; for surface or semi-flush mounting. **General Electric Co.**, Schenectady, N. Y.

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Extension Light

Safety extension light. **Davis Emergency Equipment Co.**, 45 Halleck St., Newark, N. J.

Extension light has a new type of spring contact and a guard of heavy fibre which serves as the on-and-off switch. The entire device is made of non-conductive materials, it is claimed, removing hazards of shock or danger of short circuits. Bulbs are easily replaceable, as guard is removed without the use of tools.

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Fluorescent Unit

Hot-cathode fluorescent lighting unit; utilizes 75-watt lamp; 56 in. long x 34 m.m. diameter, 115-volt unit for operation normally between 85 to 135 volts; also adaptable to 220- and 440-volt systems. **Artkraft Sign Co.**, Lima, O.

Lighting unit includes a hot-cathode fluorescent lamp and a 15-watt constant voltage resonant starting reactor. Cathode consists of a nickel mesh ribbon 2½ in. long, which is said to be maintained at constant temperature. A cylindrical cap which acts as the anode is placed over the filament and directs any sputtered emissive material toward the base of the tube, thereby keeping the luminous portion of the tube clean, it is claimed. Features are starting at 40 deg. below zero, power factor 98 percent or over, requires no starting switch.

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Testing Transformer

Type "T-4173" isolating transformer; rated at 2 kva., regulation 1 percent at 1 kva. **Acme Electric & Mfg. Co.**, Cuba, N. Y.

For eliminating interference that would affect the testing of equipment whose performance depends upon accuracy, new isolating transformer makes use of a secondary completely inclosed in a copper shield. Secondary terminal connections are provided by means of a lead shielded cable, the sheath of which is integrally joined to the copper-inclosing shield of the secondary winding. Lighting in the shielded test-room, use of soldering irons, instruments and various types of test equipment may all be operated from the secondary without causing objectionable voltage drop, it is claimed.

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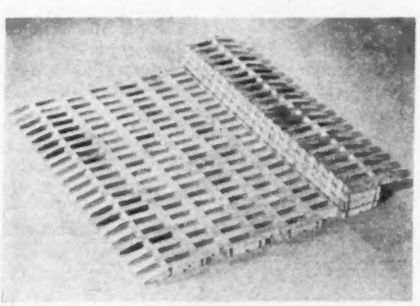
Wood Matting

Matting is constructed of wood links and can be rolled or folded for handling and cleaning. It is furnished in natural wood color and ends are beveled to reduce danger of tripping. It is said to be applicable around machinery and on oily or greasy floors.

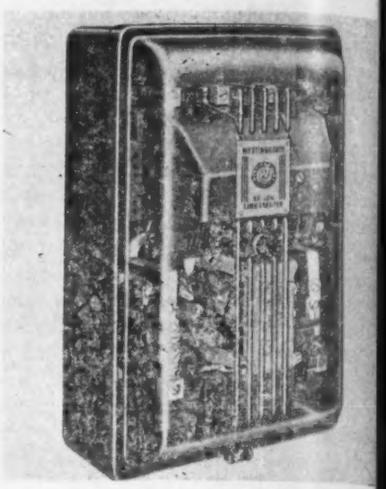


Flexible wood link matting, 1 in. thick; stock sizes: 18 x 32 in., 24 x 38 in., 30 x 44 in.; obtainable in special sizes of any length, up to 36 in. in width. **American Mat Corp.**, 1793 Adams Ave., Toledo, Ohio.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Motor Starter

Designed for group mountings, built-in applications or remote mountings, the starter is said to require less than half the



"Class 11-200" Linestarter: size 2. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

mounting space of former units without the sacrifice of wiring space. It has a clapper-type armature with knife-edge bearings, double-break silver-to-silver contacts and overload relay. On applications requiring sequence or auxiliary interlocking, provision is made for a total of four normally open or normally closed electrical interlocks. Units are suitable for machine tools, textile machinery, pumps, fans and similar machines.

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Flash Welder

"Model C" flash welder, rated at 150 kva., with "Flash-trol" monitor to provide automatic weld-quality control. **Progressive Welder Co.**, Detroit, Mich.

The first of a series of standardized flash welders incorporates a device which is said to eliminate short-circuiting of the flash-welding arc, thus providing automatic weld-quality control. The "Flash-trol" unit is based on the application of an electronic device which "warns" the machine of an impending short circuit in the welding arc. The instant this happens, the forward movement of the feed platen is interrupted, the platen jumps back a few thousandths of an inch and then reapproaches. The platen feed pump is driven by a shunt d.c. motor, powered from a single-phase a.c. line through a medium of grid-controlled rectifiers.

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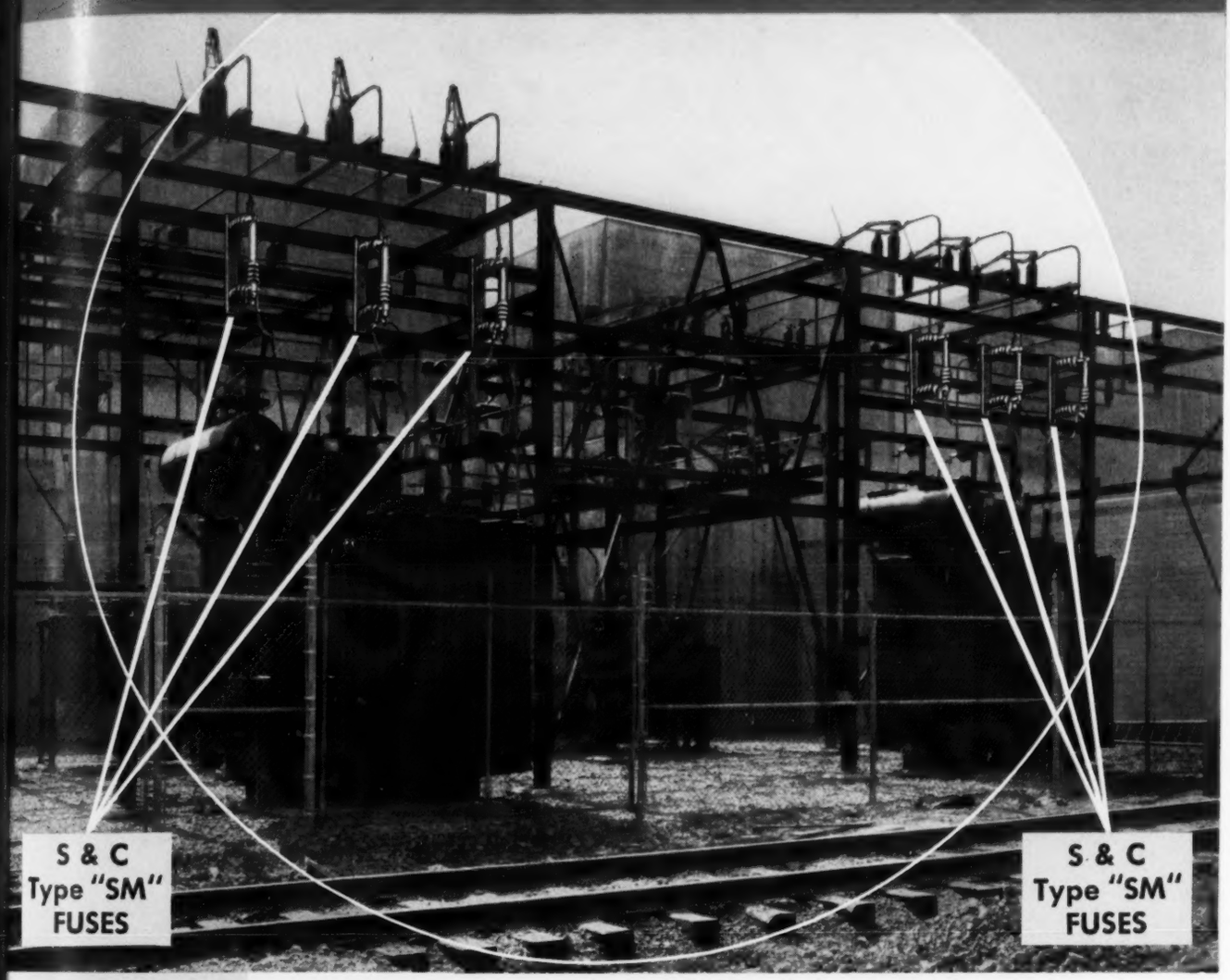
Rectifier

"Eleco" electronic rectifier; sizes up to 200 kw. **Electron Equipment Corp.**, Palm Springs, Calif.

Rectifiers for furnishing direct current are the unit type and may be operated in parallel. A 5-kw. size requires a floor space of 12 x 18 in. and weighs 300 lb. Manufacturer claims a full-load efficiency of more than 93 percent and light load efficiency never lower than 90 percent. They are said to be suitable for operation of traveling cranes, magnetic equipment, exciter service, d.c. motors, battery-charging, welding, plating and chemical uses.

PRESENT DAY ENGINEERING PRACTICE DICTATES S & C FUSE PROTECTION



THE vital importance of military equipment production has emphasized the need for unusual care in the selection of power-supply protection because unnecessary interruptions mean serious production delays.

Present engineering practice has dictated the use of dependable S & C Type "SM" Fuses for many important installations. The photograph taken on the property of an aviation motor plant illustrates the small space they require while providing adequate protection. These Fuses are well known for their accuracy, high interrupting capacity, and reliability. They save space, installation time and labor, and their use results in great savings in critical metals. Early deliveries can be made.

Type "SM" Fuse ratings are from 1 to 400 amperes, with short circuit interrupting ratings up to 1,000,000 KVA. They are made for indoor or outdoor service for use on 2300/4000, 6600, 13,200, 22,000 and 33,000 volt circuits.

(Type SMG Fuses are available for 46KV to 138KV circuits)

SCHWEITZER & CONRAD, Inc.
4435 Ravenswood Avenue **Chicago, Illinois**

SHORT CIRCUIT-INTERRUPTING RATINGS IN R.M.S. AMPERES

Fuse Voltage Rating →		7,500	7,500	15,000	23,000	34,500
Circuit Voltage →		2,300/4,000	6,600	13,200	22,000	33,000
Type and Size of Holder	**SMPC-4	17,500	15,000	12,500	10,000	7,500
	SMP-4	27,500	25,000	20,000	15,000	10,000
	**SMPC 5	30,000	25,000	20,000	17,500	15,000
	SMP-5	40,000	35,000	30,000	25,000	20,000

**Equipped with Condenser

TYPE "SM" POWER FUSES

Neglect a Motor AND YOU Sabotage a Motor!

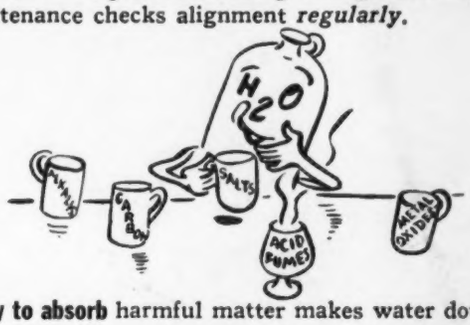
WHOSE MOTORS LAST LONGEST MAY HAVE A LOT TO DO WITH WHO WINS THIS WAR!

AS ONE of the world's leading builders of electric motors, Allis-Chalmers takes its hat off to the men of maintenance who are working day and night to keep America's motors *rolling!*

Like an overloaded horse, a motor worked too far beyond its horsepower capacity is sure to break down. So while maintenance men know that we've got to get maximum protection out of every motor to win this production war . . . they also know that a close eye must be kept on every motor's overload protection. New fuses and heater coils are a whole lot cheaper than new motors!

The oil film protecting a motor's bearings often is no thicker than the wall of a soap bubble. And if pressure on it becomes too great, the film can fail just as suddenly and *completely!* To protect bearings, maintenance must first protect the *oil film* . . . by guarding against excessive pressures from misalignment.

Spur gears constantly try to push apart, foundations are apt to settle, floor loading can be too heavy . . . all threatening to disturb alignment. Misalignment sometimes gives a warning before causing damage. But to play safe, maintenance checks alignment *regularly.*



Ability to absorb harmful matter makes water doubly dangerous. Evaporated moisture is pure water when it first condenses in a motor — isn't yet an active destructive agent. That's the time to get it out — *fast!*

Dust fights lubrication. Once inside bearings, it can be as harmful as sandpaper to highly polished surfaces. To keep dust out, oil filler caps must be kept closed — dust seals and gaskets replaced when worn.

Is Allis-Chalmers' new maintenance handbook helping maintenance do its big new wartime job in *your* plant? It's the latest and last word on the subject, easily understood, abundantly illustrated (with dozens of sketches such as above). Send in today for *your* free copy to ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

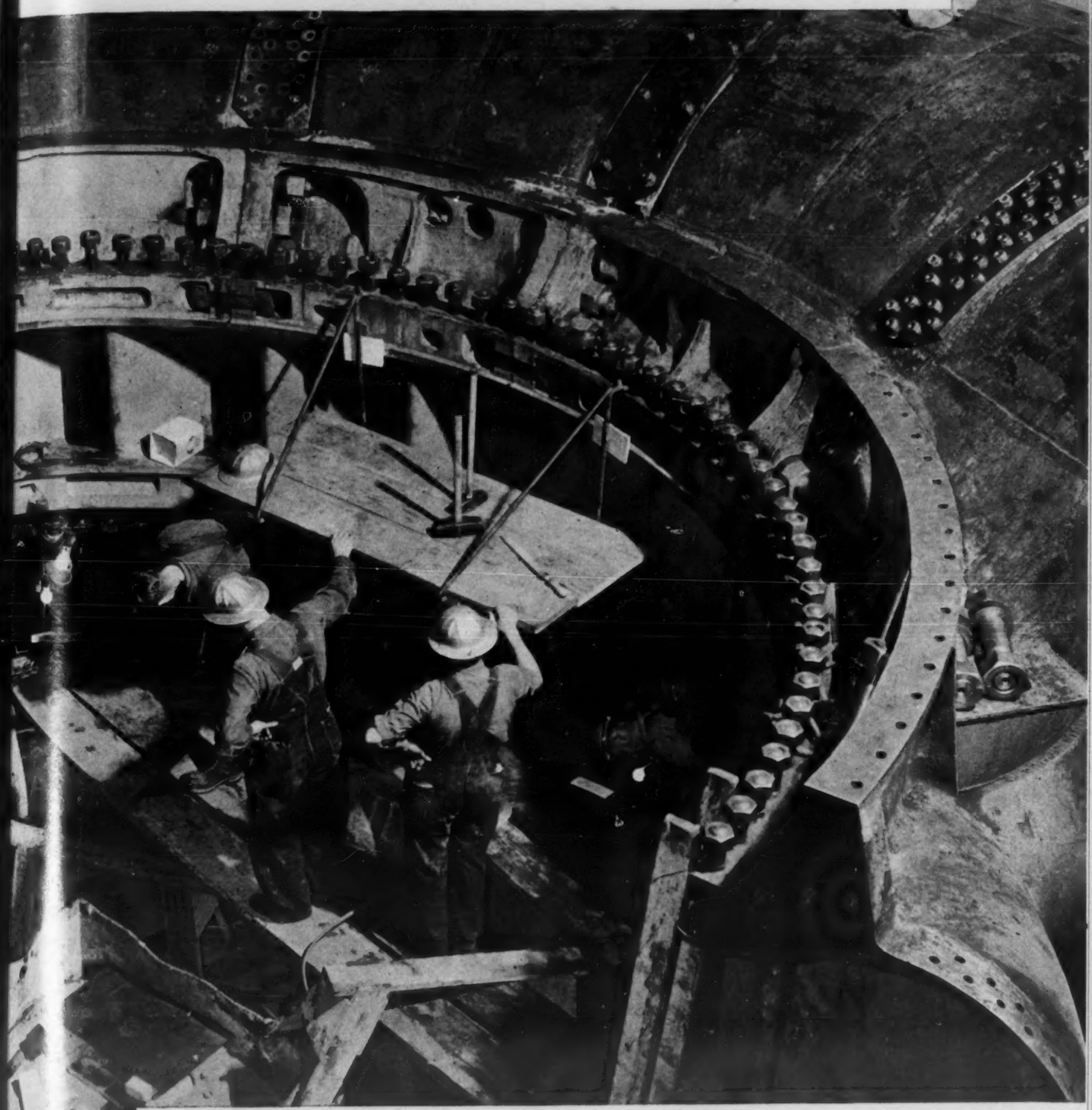
A 1554

ALLIS-CHALMERS

WE WORK FOR VICTORY WE PLAN FOR PEACE

Electrical World

FEBRUARY 20, 1943



INSTALLATION OF A SHASTA TURBINE AT GRAND COULEE

HELP *the* WAR EFFORT *without cost!*

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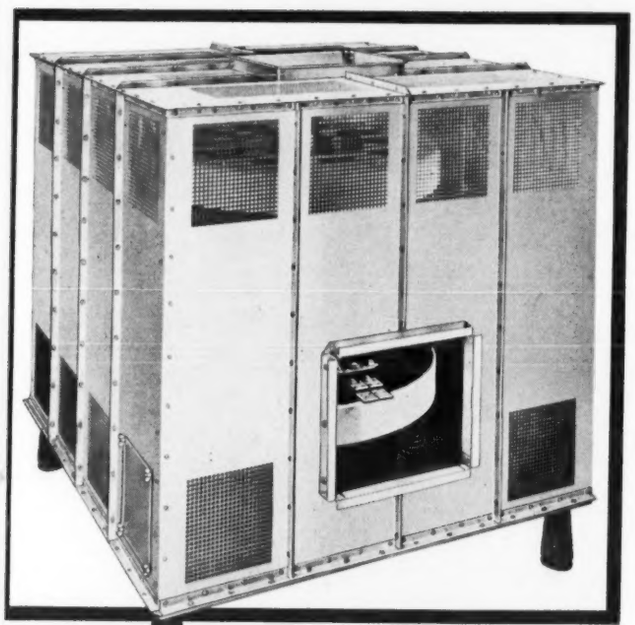
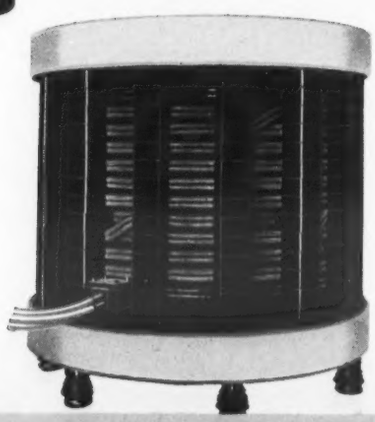
MURRAY REACTORS CAN CARRY INCREASED LOADS WITHIN SAFE ADDITIONAL TEMPERATURE RISE!



THE boosts in current consumption needed for war-time industries are putting overloads smack up to current limiting reactors—the safety valves of electrical distribution. Old Murray Reactors (some in service 20 years and more) are taking overloads safely—with a cool smile. They are doing their share without extra cost. Even 20 years ago, Murray provided adequately for more effective heat dissipation. And NOW with war-time overloading, Murrays still stay "cold." That's why they're doing their job today and will tomorrow. And, of course if you need new Murray Current Limiting Reactors in addition to your old ones—we're ready to serve. Metropolitan Device Corporation, Brooklyn, N. Y.

OTHER MURRAY DEVICES

Aerial Ladder
Cable Racks
Malleable Str
Meter Boxes
Meter Seals
Meter Switche
Panelboxes
Safety Switche
Testing Device
Wiring Trough



Murra

CURRENT LIMITING

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Electrical World

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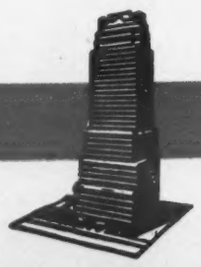

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, N. Y.

Director of Circulation:
Please change my address on Electrical World

From .....

.....

To .....

.....

Signed .....

How to Get Extra Life and Efficiency From Electrical Wires and Cables

1 STORE CABLES IN A COOL PLACE—High temperatures tend to break down rubber. Stored in a cool (not cold), uniform temperature, cable insulation is kept in the best condition for the longest possible life. Always avoid extreme temperatures.

2 KEEP REELS AND COILS OFF GROUND — Continued moisture rots wooden reel heads and fibrous cable coverings. Sound reels are easier to handle and well-preserved cable coverings give longer life in service.

3 PROTECT CABLES FROM WEATHER — Sunshine, light, rain, snow and freezing contribute deterioration of rubber sheaths and fibrous coverings. Keep cables under cover. Otherwise, be sure to keep lagging on reels.

9 SPLICES WILL LAST LONGER when protected by a coating of weatherproof paint.

10 PROTECT THE JOINTS OF CABLES IN MANHOLES from fire by proper fireproofing.

11 UNDERGROUND INSTALLATIONS (without ducts) — keep ground saturated with water to lower earth temperature and dissipate heat more readily.

12 TUNNEL INSTALLATIONS — ventilate tunnels with grille where possible or install a blower at one end of the tunnel to force hot air out. Make sure circulation goes all the way through tunnel so hot air does not pile up at one end.

13 DUCT INSTALLATIONS — when possible circulate cool water through or flood duct lines and keep manholes flooded. But be sure your cables are water-tight.

14 ...EAR HEATING UNITS or hot pipes, move ...r wiring or insert baffles between steam ...pes and cables to deflect hot air from the ...cables.

15 ...HOT LOCATIONS — Cut air vents in the ...ing or partition above cables to provide ...ximate circulation by means of natural ...vection or install fans.

16 ...CY CABLES for evidence of mechani... ...ation at conduit edges and for ... ...deterioration and abrasion. Eliminate ... by retaining cables and apply... ...protective paint.

17 VENTILATE POLE RISER CONDUITS and create circulation by making openings near the top or by leaving space between the conduit and pothead. This can improve the efficiency of an entire circuit.

18 SPACE YOUR CABLES as close together as possible on overhead circuits if you need to reduce reactive voltage drop. Leave sufficient space for air circulation to prevent overheating.

19 PROTECT cords from being run over by heavy moving equipment, dropped around sharp corners, yanked to remove hooks.

20 SHIFT cords and cables away from high voltage equipment and sparking motors. Such machines generate ozone which attacks rubber and hastens its deterioration.

21 DON'T run cords and cables over small diameter pulleys or drums. Continued bending and flexing around a short radius breaks the conductors. Use larger diameter pulleys.

22 WIPE cords regularly so they are free from oil, grease and chemicals. Such agents attack rubber.

23 KEEP cords out of light and sunshine as much as possible when in use. Light tends to harden rubber — thus hastening cracks.

24 MOVE cords away from steam lines, furnaces and hot objects. High temperature damages rubber.

...insulation will then last longer with the ...nductor load, or more current can be carried in the same cable without shortening its life.

...ambient temperature) of the surrounding air (ambient temperature)

Get this Handy Wall Chart FREE!

Now, when electrical wires and cables are difficult or impossible to replace, it is more important than ever that your electrical maintenance men take good care of your wires and cables to secure maximum life and efficiency. This handy wall chart will show them how to do it.

We will be glad to supply, free, as many reprints of this chart as you require.

THE OKONITE COMPANY
and HAZARD INSULATED WIRE WORKS DIVISION
Executive Offices: Passaic, N. J.
Offices in principal cities

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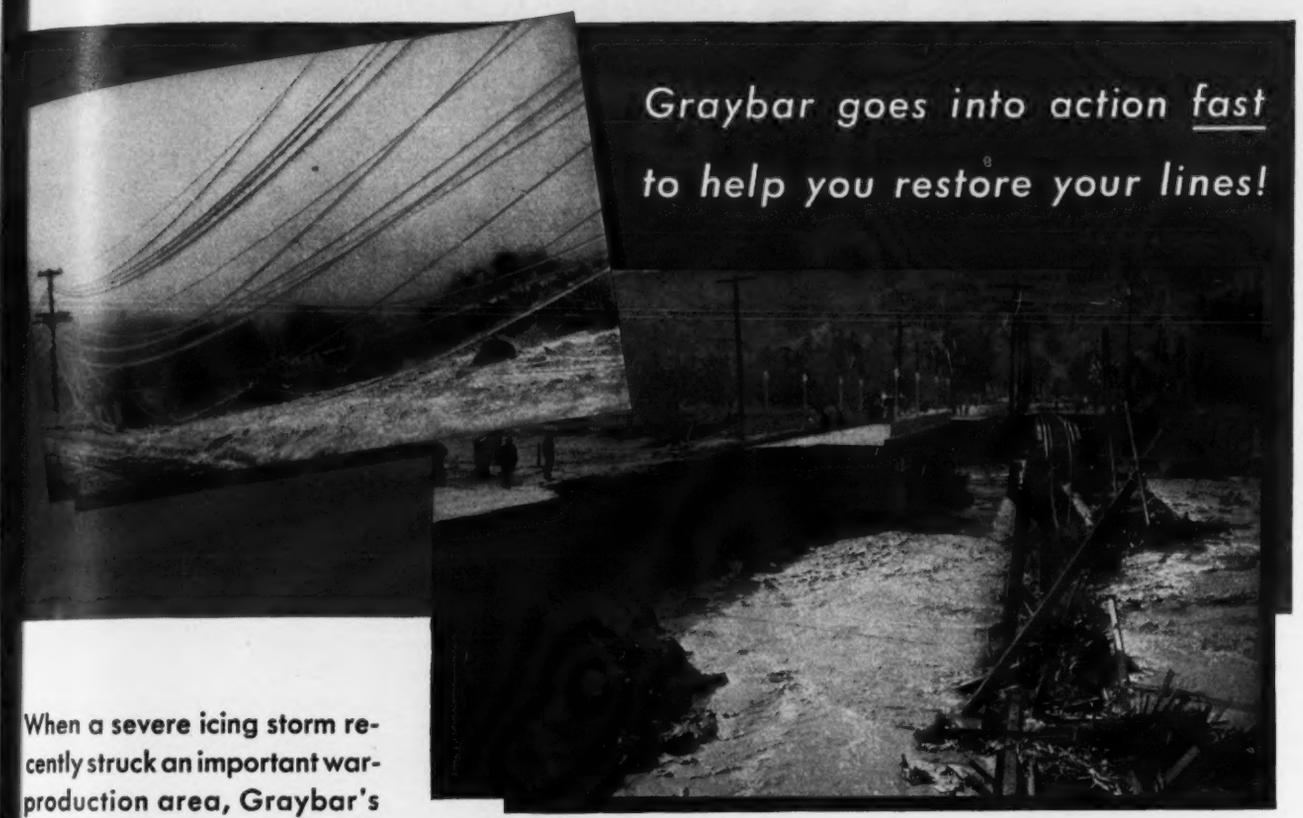
THE OKONITE COMPANY PASSAIC, NEW JERSEY
OFFICES IN PRINCIPAL CITIES

3219

BUY U. S. WAR BONDS *Every Payday All Okonite Employees* BUY U. S. WAR BONDS

"Come Hail or High Water..."



When a severe icing storm recently struck an important war-production area, Graybar's local warehouse staff was in action *before dawn*. The first truckload of emergency pole-line supplies moved out to the point of greatest need at 7:30 that morning . . . less than two hours after the emergency call had reached the Graybar manager at his home.

Fast action of this sort is not exceptional with Graybar, and it goes deeper than a mere *desire* to serve you well. Out of the experience obtained in previous storms, floods and other emergencies, such as the New England hurricane, Graybar has learned lessons of advance planning. Even under today's limitations on warehouse stocks, available supplies are located so as to stretch their value as "emergency insurance". Graybar's "distribution network" acts like a power network to meet the demands of an area that's badly hit.

HOW YOU CAN HELP

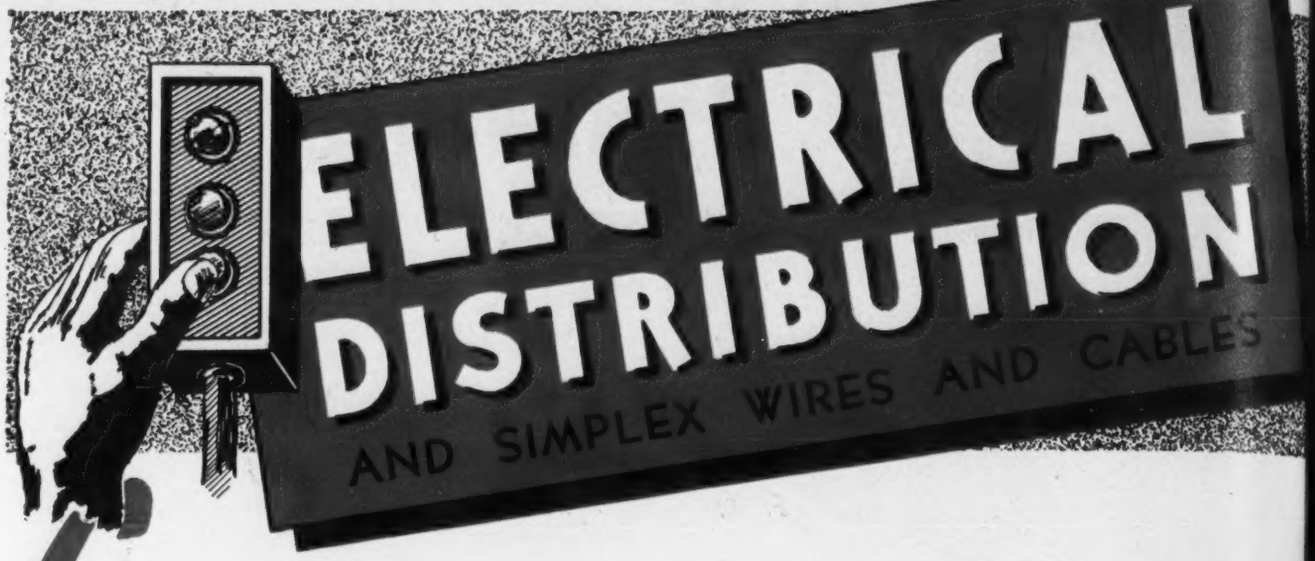
To get the full benefits of this emergency service under war conditions, it pays to establish close contact with your Graybar Representative right now, before trouble strikes. Thus, dangerous scarcities can be foreseen, substitutes or alternates considered, and duplication of effort avoided. When the call comes for *action*, Graybar will be ready to roll without the need for detailed instructions. Why not talk the matter over with Graybar today?

GraybaR

IN OVER 80 PRINCIPAL CITIES

GraybaR QUALITY Since 1869 * REG. U.S. PAT. OFF. — Everything Electrical . . . . THAT IT TAKES TO WIN!

Executive Offices: GRAYBAR BUILDING, NEW YORK, N. Y.



COMPARATIVELY few years ago the first commercial generating station began to supply electricity for a small section of New York City. Those who witnessed the inauguration of that service had little idea of the awe-inspiring growth that has taken place during the years that have passed. We who enjoy the efficient, dependable service of today find little to remind us of the early uncertainties and difficulties.

The generation, transmission and distribution of electrical energy for power and light has become one of the giant industries of the country in th short space of about seventy-five year The modern public utility power statio and distribution system is a magnificen example of engineering achievement.

The development of the insulate wires and cables upon which distribu tion depends has been less spectacula but of equal importance. Cable desig and improvement in insulations ha paralleled the advancement of the ele trical industry in general. The moder insulated wire or cable is the result o prolonged research and intensive stud of dielectrics.

In this particular field Simplex has been a pioneer for nearly sixty years. Many important developments in cable design and insulation have come from Simplex Laboratories. Under present conditions with our entire output required for essential or war work our Laboratories are helping us to meet military requirements and, at the same time, preparing for better, more efficient wires and cables for commercial uses after the present emergency has passed.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex

WIRES and CABLES

CHECK THE FACTS on R&IE Products

ONE RESPONSIBILITY

for the building of and application of equipment to

COMPLETE SUBSTATIONS—correctly designed, structurally and electrically, from single line wiring diagrams. Designers plan for rigidity, to withstand strains and assure alignment of equipment; economy, to omit excess parts and provide efficient bus layout; flexibility, to meet future requirements. Speedy, orderly shipments, eliminate erection delays. Complete comprehensive proposals are proof of R&IE understanding of your problem.

ENGINEERING AND PRODUCTION

COMPLETE SUBSTATION

OPERATING MECHANISMS

AIR BREAK SWITCHE

BUS CLAMPS

CONNECTORS

DISCONNECTING SWITCHES

CUTOUTS

THERMO-RUPTERS

METAL HOUSED, SEGREGATED BUS

AUTOMATIC THROW-OVER EQUIPMENT

METAL CUBICLES

INTERLOCKS

TESTING DEVICES

ILWAY AND INDUSTRIAL ENGINEERING CO.

ENSBURG, PA. . . . . IN CANADA, Eastern Power Devices, Ltd., Toronto

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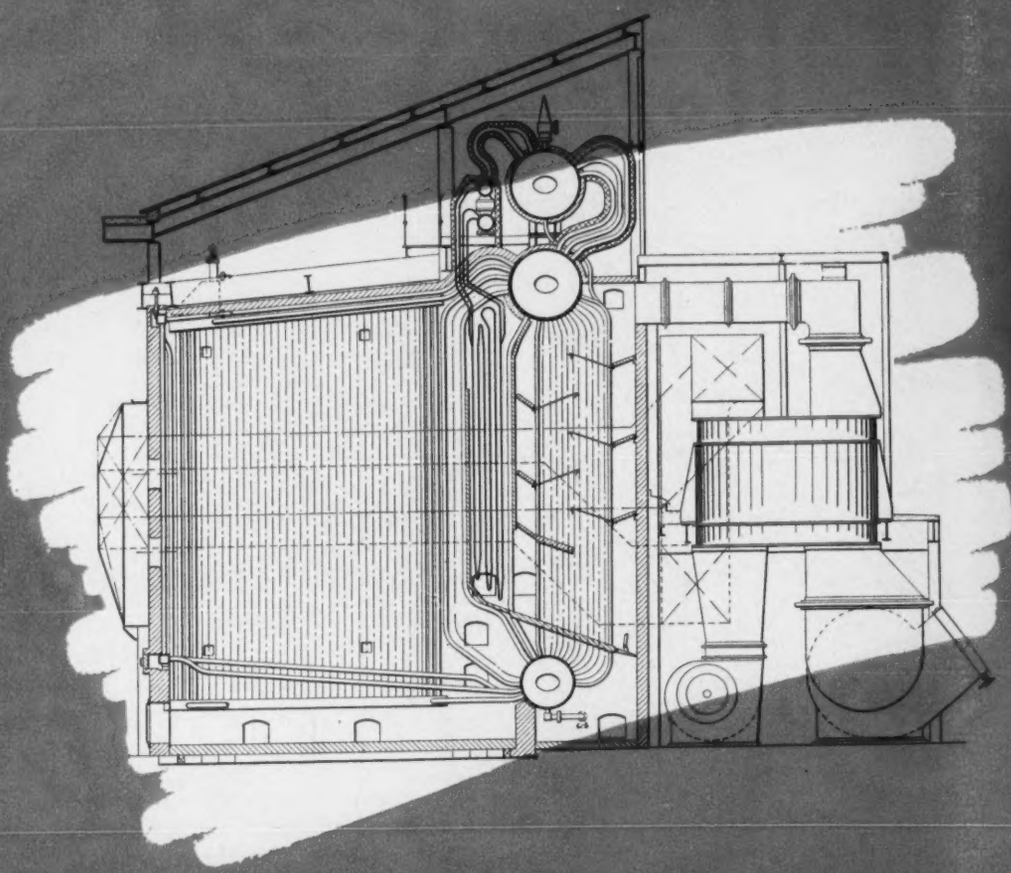


One of two identical VU Steam Generators responsible for the 194? performance record described on the right-hand page. Maximum continuous capacity of each—200,000 lb of steam per hr. Drum design pressure—525 psi. Total steam temperature—760 F.

...ON THE FOOD PRODUCTION LINE...

...FOR 97% OF ALL THE TIME...

...IN 1942

In the heart of America there's a central station whose output is chiefly used to provide power and processing steam for three of the nation's huge meat packing plants. The varied products of these great food packers are being distributed among American service men all over the world, the people of the other United Nations, as well as the civilian population at home.

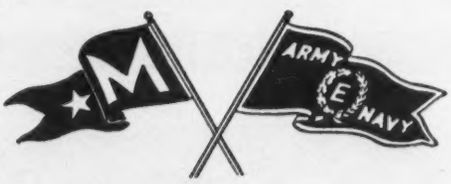
Since food is as vital as planes, tanks or guns, the dependability of the two C-E Units which comprise the steam generating equipment of this central station is of obvious importance to the war effort.

Since they first went into service in 1938, these C-E Units have turned in a consistently fine performance. But what's more impressive, is how well they responded to the increased demands for steam during 1942, our first full year of total war.

During 1942, the two units together produced 2,500,000,000 pounds of steam. The use factor for the combined units was 97%. The availability for the period was identical for both units, slightly better than 98%.

The average over-all efficiency for the year was more than satisfactory for natural gas-fired units . . . 82.9% . . . a figure which corresponds almost exactly with the original estimated performance.

Here is additional evidence of the benefits reaped by the country from the wisdom of the public utilities in pursuing a practice during the past of producing power more cheaply, more dependably and more abundantly. It is largely because of this policy that our public utilities have been able to meet the tremendously increased demands for power with little addition to existing facilities and correspondingly small requirements for critical materials. A-717

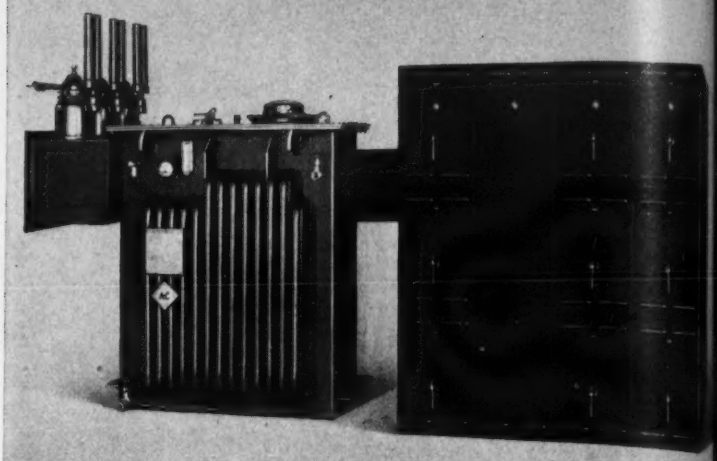


COMBUSTION ENGINEERING

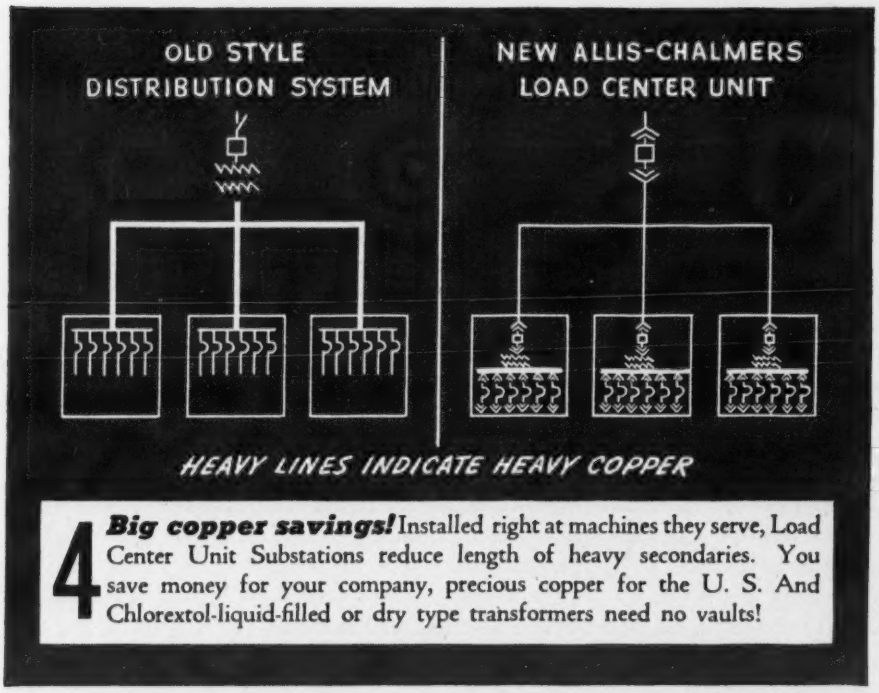
200 Madison Avenue, New York, N. Y.

Here's the Plus

Modern packaged design of great new Allis-Chalmers Standard Load Center Unit Substations gives you 6 important new wartime *and peacetime* advantages!



1 *Faster deliveries!* Standardized design of Allis-Chalmers Load Center Unit Substations eliminates "specials," saving time on drafting board and in shops. Yet these units are completely adaptable to your needs . . .



4 *Big copper savings!* Installed right at machines they serve, Load Center Unit Substations reduce length of heavy secondaries. You save money for your company, precious copper for the U. S. And Chlorextol-liquid-filled or dry type transformers need no vaults!

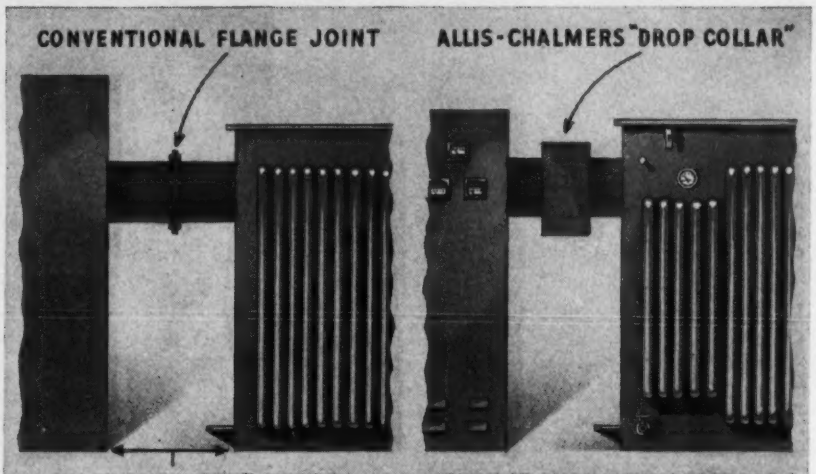
5 *Better performance!* Lower losses and improved regulation give you better motor and lamp performance.

ALLIS-CHALMERS

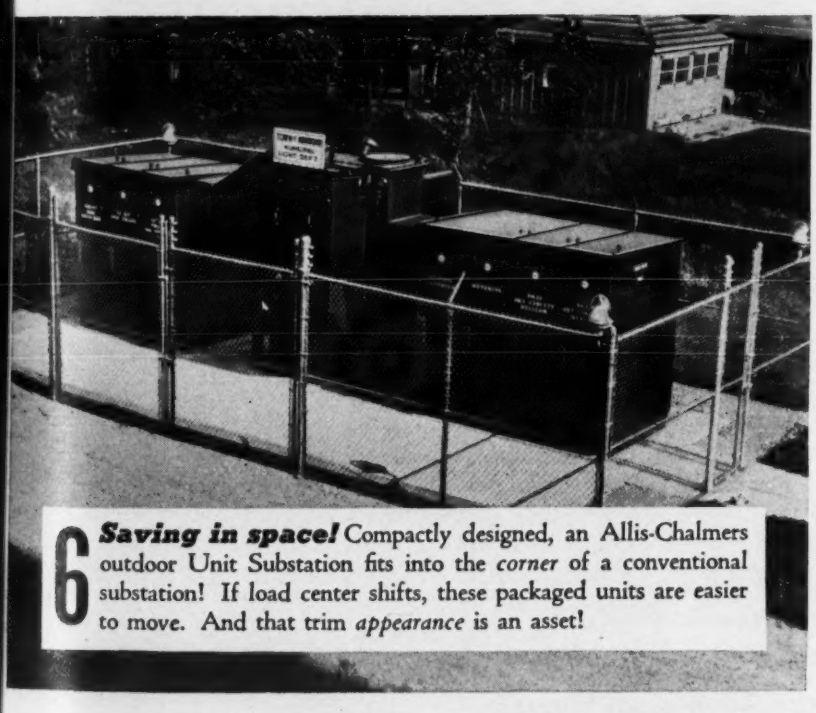
in Packaging!

HIGH SIDE	LOW SIDE
1. DISCONNECT SWITCHES	1. STATIONARY AIR BREAKERS
2. OIL FUSE CUTOUTS	2. DRAWOUT AIR BREAKERS
3. METAL-CLAD SWITCHGEAR	(CAN BE ELECTRICALLY OR MANUALLY OPERATED)
4. DIRECT CONNECTION TO ROOF BUSHINGS	
5. THROAT CONNECTION TO BUS RUN	

2 ***Flexibility!*** Note wide variety of high and low voltage equipment. Transformers are oil or Chlorextol-liquid-filled or dry type.



3 ***Easier installation!*** Allis-Chalmers "drop collar" on outdoor units and on high side of indoor units means no flanges to bolt, no need for exact alignment at base. Flexible cable low-voltage connection on indoor units also saves time.



6 ***Saving in space!*** Compactly designed, an Allis-Chalmers outdoor Unit Substation fits into the *corner* of a conventional substation! If load center shifts, these packaged units are easier to move. And that trim *appearance* is an asset!

It All Adds Up to Smart Buying!

WHEN YOU specify Allis-Chalmers Standard Load Center Unit Substations, you specify faster deliveries, great flexibility, big savings for your company in both installation time and space!

That's smart buying—and patriotic buying, too. These new units help you contribute important copper saving to the war effort!

Get the *full* story on Load Center Unit Substations from the district office near you. ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

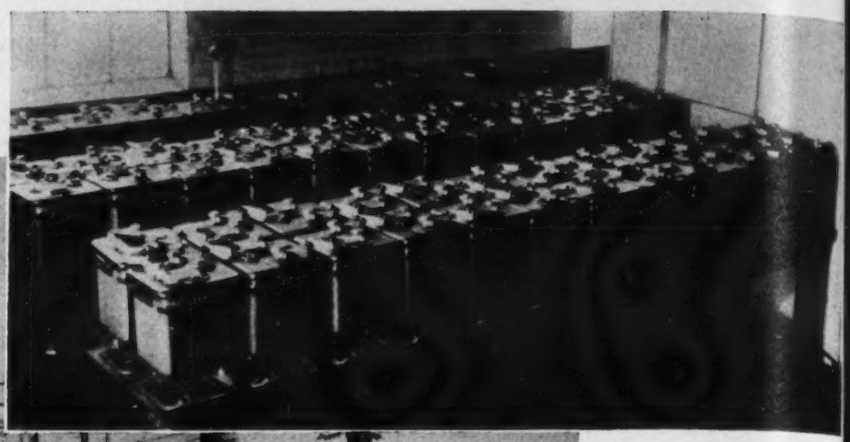
A 1587

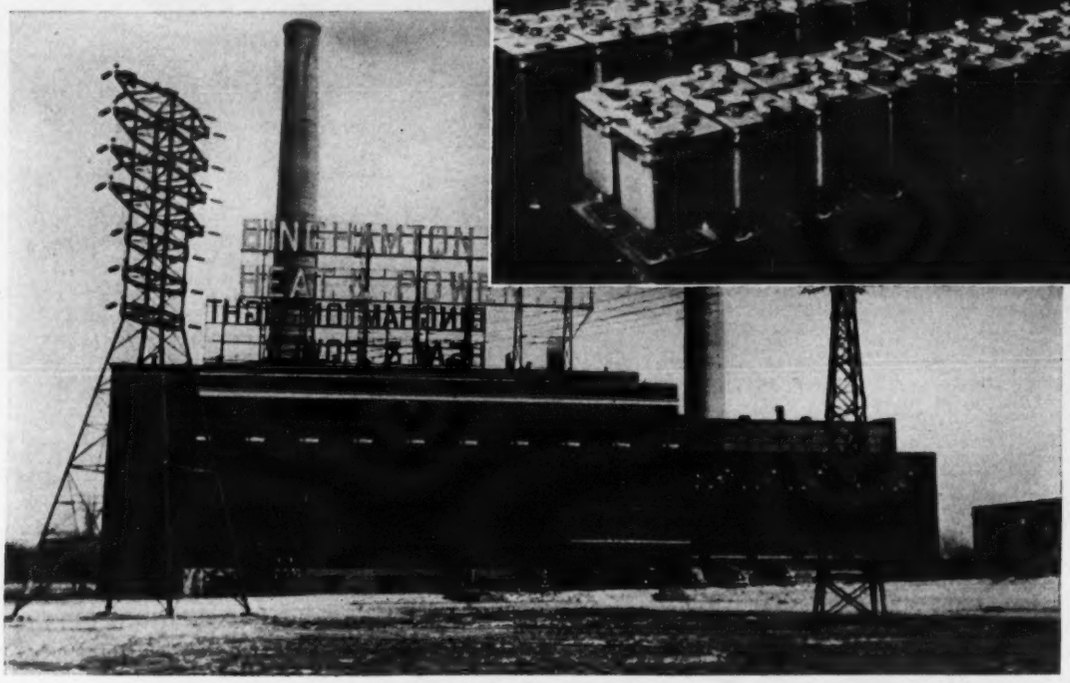
UNIT SUBSTATIONS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

AT RIGHT: The 60-cell Exide Chloride Battery used for operation of oil-circuit breakers and steam valves, and for emergency lighting within the station.

BELOW: The 53,000 k.w. Westover Plant which supplies Binghamton, Endicott, Johnson City, and nearby small villages.





PEACE-TIME FORESIGHT ASSURES WAR-TIME STATION PROTECTION

Exide
CHLORIDE
BATTERIES

PICTURED above is the 53,000 k.w. Westover Plant of the New York State Electric and Gas Corporation at Johnson City, N. Y., and the 60-cell Exide Chloride Battery which assures it of unfailing three-way protection. For not only does this battery assure operation of this station's many oil circuit-breakers and emergency lighting system, but it also operates the 12, 14 and 16-inch valves used on the 200 and 400-lb. steam mains supplying the turbines.

The possibility of war was not considered when this battery was purchased. It was chosen solely because of its almost traditional reputation for dependability, long life, and ease of maintenance.

However the advent of war and the necessity for conserving the vital materials used in storage battery construction have emphasized the wisdom of judicious battery buying at all times. For, in addition to the unfailing protection which the Exide Chloride has already rendered the Westover Plant, the management is assured of continued protection at a time when battery failure might prove a calamity to industries in those cities served by this station.

Exide Chlorides are giving equally gratifying service in thousands of plants all over the country. And while they are almost as famous for their ease of maintenance as they are for their long life and dependability, that maintenance is particularly important in these times. Observe the four rules given at the left, and if you have a special maintenance problem, write us. Send for Bulletin 3225.

DO THIS TO MAKE YOUR BATTERY LAST—

1. Add approved water at regular intervals. Probably your local water supply is safe to use. If in doubt, ask us.
2. Keep top of battery clean and dry.
3. Check your D.C. control-bus voltmeter to see that it is in calibration. Keep battery fully charged but not overcharged.
4. Keep written records of water additions, voltage, and gravity.

Faithfully observed, these four rules of maintenance will help you to obtain from your Exide Battery all the long life that is built into it. If you need more personal assistance, our Engineering Service Division will be glad to cooperate with you.

THE ELECTRIC STORAGE BATTERY COMPANY

The World's Largest Manufacturers of Storage Batteries For Every Purpose

PHILADELPHIA

Exide Batteries of Canada, Limited, Toronto

The inside and outside porcelain components of an O-B 115-kv. bushing.

The Finest Bushing Insulation

—and yours forever!

2408-H

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

★

KEEP BUYING WAR BONDS

★

● **You get the best insulation where it's needed most in O-B porcelain-filled bushings. Porcelain possesses ideal dielectric qualities. Porcelain absorbs absolutely no moisture. Porcelain cannot be carbonized by leakage currents. Porcelain is one of the most everlasting substances known--it's best to start with, and stays that way forever...That's why O-B bushings are made of porcelain, inside as well as out. That's why these bushings are setting new standards for long life and complete freedom from trouble. That's why your next bushings should be O-B. It's the only way you can get rugged, porcelain internal dielectric--the finest insulation, and yours forever!**

The "64 Dollar Questions"

What Do You Read?

Look in your favorite magazines for the new G-E ads. You'll like 'em! Here's the schedule for the month of February:

MAGAZINE	DATE ON NEWSSTAND	ISSUE DATE
Post	Feb. 24	Feb. 27
Life	Feb. 26	Mar. 1
Collier's	Feb. 26	Mar. 6
Look	Feb. 9	Feb. 23
American Home	Feb. 25	March
House Beautiful	Feb. 20	March
Woman's Home Cp.	Feb. 20	March
Holland's Magazine	Feb. 15	March
Country Gentleman	Feb. 24	March

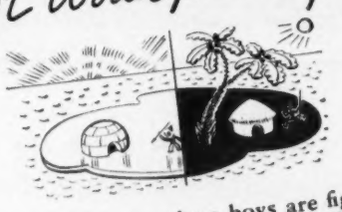
Answered Here!

"INFORMATION PLEASE" General Electric Consumers Institute answers hundreds of questions about rationing and restrictions, shortages and substitutes. All those problems puzzling America's wartime homemakers are being carefully studied and sensibly solved in the Institute's experimental kitchens, laundries, and research laboratories. And the answers make up a very useful library of booklets and bulletins for your customers. They're doing a swell job of building goodwill now for good business after Victory.

"SPANKING BREEZE"! G-E fans have gone to sea and how those U.S. Navy men need them. In fact there are few available for civilian use. But that's all right... America knows how much more important it is to have U.S. submarines, crowded transports and compact fighting ships kept comfortable and healthful.

SMALL TOWN SPECIAL! From Schenectady a series of G-E Institutional ads goes out to over 1400 local "country" newspapers. This is in addition to the many G-E ads appearing in the leading national magazines like Life, Collier's, Sat. Eve. Post, McCall's, etc. All this helpful advertising creates tremendous goodwill for every G-E retailer.

G-E World Tours Dept.



Wherever American boys are fighting you'll probably find a General Electric Refrigerator somewhere behind the lines where the sick and hurt are cared for. G-E Refrigerators—on the war front—are helping save soldiers' lives by keeping blood banks and precious serums safe and ready for use.

NOW SHOWING! Colossal! Stupendous! Breath-taking!!!
Well anyway, these G-E Service Training Films are pretty darn good. The one titled "Into the Wringer and Out" shows dealers how and why to go after service and repair business. If you would like to see it, get in touch with your G-E Appliance Distributor and he'll arrange a personal showing.

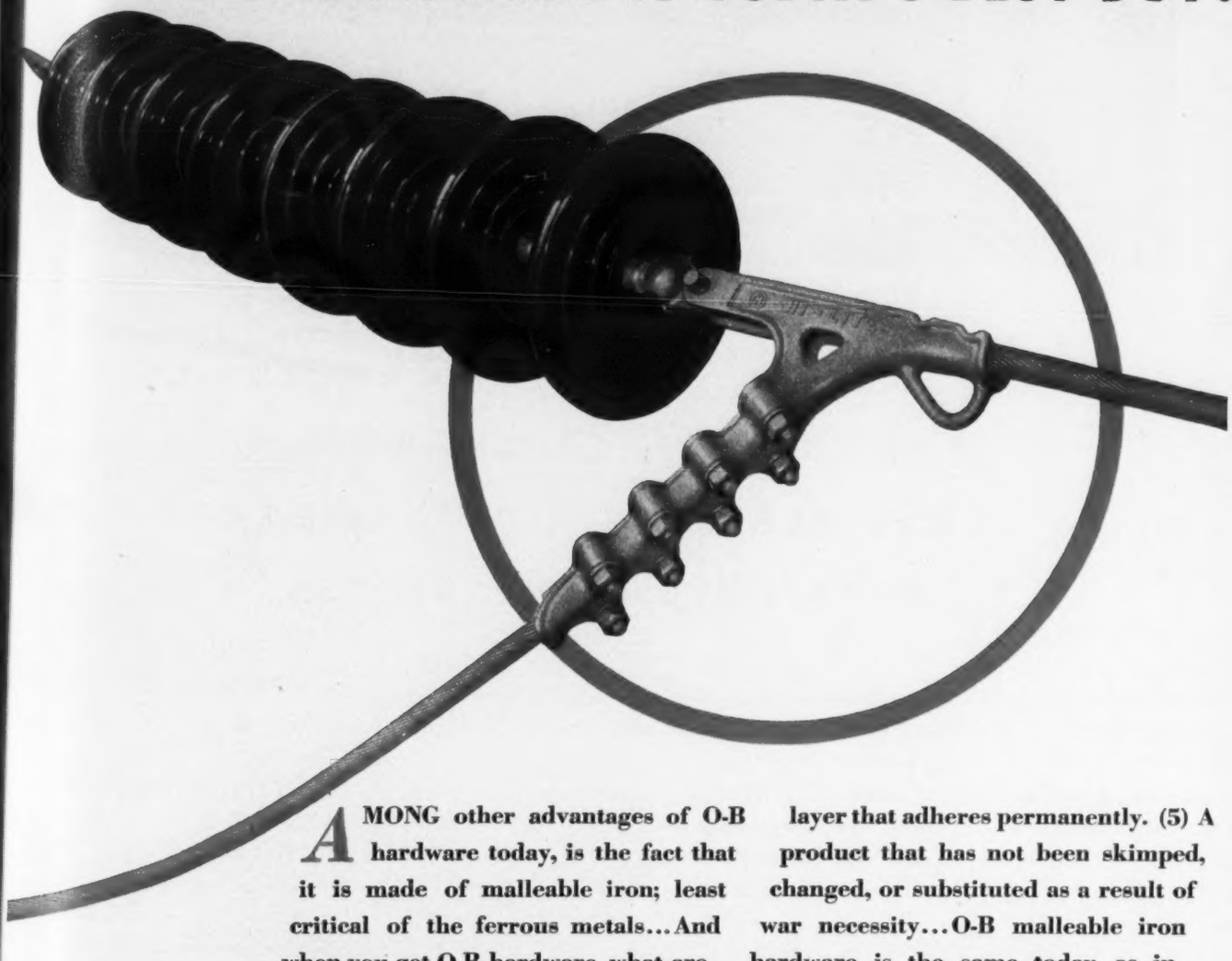
SCRAP IS POWER
YOU HELP
...The War Effort...Your Customers and Yourself
When you salvage, in accordance with your manufacturer's instructions, all inoperative parts containing
CRITICAL MATERIALS
Cooperate with your industry! Put vitally needed scrap back into the scrap TODAY!

WAR BONDS WILL BUILD AND EQUIP NEW VICTORY HOMES TOMORROW

GENERAL ELECTRIC

Call it lucky if you want but...

O-B HARDWARE IS TODAY'S BEST BUY!



AMONG other advantages of O-B hardware today, is the fact that it is made of malleable iron; least critical of the ferrous metals... And when you get O-B hardware, what are you buying? (1) A product whose shape is produced by casting, which imposes little or no limitations on basic design as a result of fabrication problems. (2) A metal that is conspicuous for its ability to withstand twisting, shocks, and deformation without failure. (3) Designs that possess high strength without undesirable bulk or weight. (4) A metal that is unique in its resistance to corrosion damage, as the first exposure produces an indestructable iron-oxide layer that adheres permanently. (5) A product that has not been skimped, changed, or substituted as a result of war necessity... O-B malleable iron hardware is the same today as in years past. No unsound expedients or alterations have been necessary. Also just the same is its excellent performance that has given it first preference among hundreds of critical hardware users... To be sure of getting hardware, and also sure of *what* you are getting, specify O-B.

2421-H

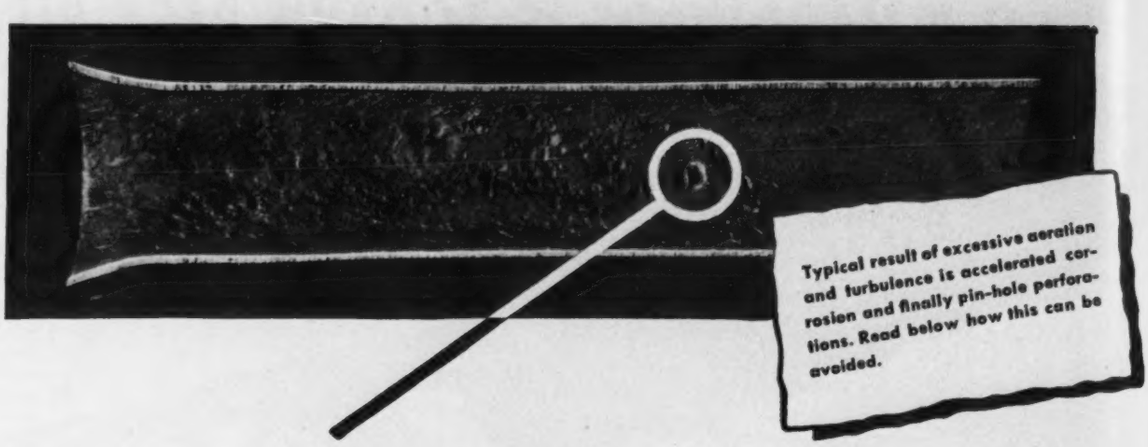
Ohio Brass (B)

MANSFIELD, OHIO

Canadian Ohio Brass Co., Limited., Niagara Falls, Ontario

★ ★ ★ KEEP BUYING WAR BONDS ★ ★ ★

No. 2—how to prolong condenser tube life


Typical result of excessive aeration and turbulence is accelerated corrosion and finally pin-hole perforations. Read below how this can be avoided.

THIS HOLE, CAUSED BY EXCESSIVE AERATION AND TURBULENCE, COULD HAVE BEEN AVOIDED

Finely divided air bubbles increase corrosion and the effect of turbulence. Worn packing on the pumps allows leakage of air into the water. The water level in the intake canal may be so little above the level of the suction pipe end that eddies form around the pipe and large quantities of air will be intermittently drawn into it. If the water is saturated with dissolved air, differences in pressure in the pump itself may liberate the air which has no chance to redissolve before passing into the tubes. In some places a long intake canal into a shallow tidal basin is impractical and in such cases the water may be pumped twice, once into a supply or surge tank on shore, then to the condenser in the usual way. If the surge tank is small the water pumped into it may be white with entrained air. If such water is circulated to the condenser, corrosion will certainly be rapid. The surge tank should be large enough so that baffles can be placed in it to quiet the water and allow the air to escape before it is pumped to the condenser.

The location of the sea chest on a ship, its size and the construction of the strainer have a marked effect upon turbulence which produces entrained air. Tube life can often be improved by increasing the size of the sea chest, by using a louvre type screen, with slats placed lengthwise to the water flow instead of a woven wire screen. Sharp edges of double plates can be filleted by welding to reduce turbulence. Even after all practical precautions have been taken there may be some air in the water.

If the water inlet of the condenser box is too narrow there may be great differences in water velocity due to eddies. Entrained air will collect in the quietest water, then pass through the tubes to cause failures in definite locations. If the condenser is a "double pass" with a horizontal web in the center, it will often help to drill a few holes in the web where pockets of air collect, thus by-passing some of the water and most of the air to the outlet water box.

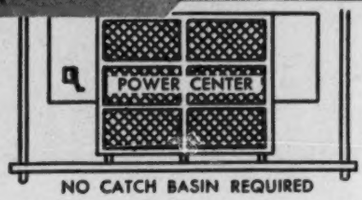
A request on your letterhead for more complete information on the prolongation of condenser tube life will receive prompt attention.

ANACONDA

Anaconda Condenser Tubes

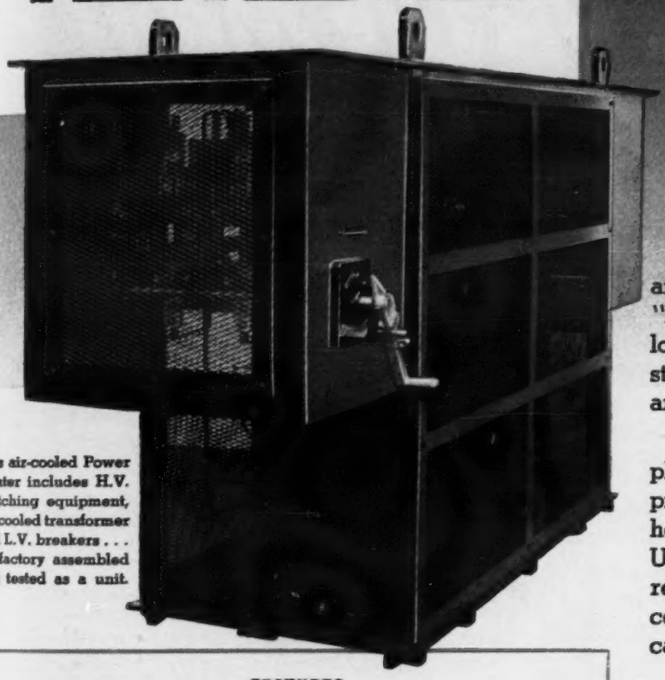
THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company. In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.



NO CATCH BASIN REQUIRED

Nearer the Load Center
to improve voltage regulation
. . . and power
anywhere you need it
in a hurry
with Westinghouse
Power Centers



This air-cooled Power Center includes H.V. switching equipment, air-cooled transformer and L.V. breakers . . . all factory assembled and tested as a unit.

Power centers are available for installation anywhere . . . indoors or outdoors! They are "Packaged Power" to supply concentrated loads. Unit construction saves man-hours in installation and production time because all units are factory assembled and tested.

Westinghouse Power Centers have been applied in all types of Industrial Plants and are proving ideal in office buildings, apartment houses, air bases, Navy Yards, and Army Camps. Used near the load center, they improve voltage regulation and often save more than 75% of the copper otherwise required for long secondary cables.

Power Centers are available with oil, Inerteen, or air-cooled transformers; high-voltage fuses, disconnect switches or selector switches; low-voltage panelboards, breakers or throat-connected, low-voltage switchgear.

Air-Cooled and Inerteen Power Centers can be mounted overhead to save floor space . . . with perfect safety to workmen below.

Ask your Westinghouse representative for complete information, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70400

FEATURES

- Factory assembled and tested
- Low installation cost
- Less copper
- Better regulation
- Safe
- Attractive
- Minimum space
- No vaults required*

ADDED ADVANTAGES OF AIR-INSULATED POWER CENTERS

- Fire hazard is eliminated. Transformer is completely air-cooled. No cooling or insulating liquids of any kind.
- Explosion hazard is eliminated.
- Toxic gas hazard is eliminated.
- Inspection and maintenance are reduced to a minimum.

**National Electric Code permits air and Inerteen-Insulated units to be installed indoors without fireproof vaults.*

Westinghouse
POWER CENTERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Just Like His 'Ole' Man!

He's smaller in size and power, but his features are just like those of his "ole man". Yes, the good qualities that are built into Pennsylvania Power Transformers are found in equal measure in Pennsylvania Distribution Transformers.

FOR EXAMPLE:

1 CIRCULAR COILS Distribution as well as Power Transformers have Circular Coils. These coils have the maximum inherent mechanical and electrical strength and are balanced radially and axially against short circuit stresses.

2 VARNISH-TREATMENT No compounds are used in Pennsylvania Coils. Coils are treated in varnish at a maximum temperature of 105°C. This temperature leaves the insulation in a safe and pliable state. When baked, the varnish will not be affected by oil or heat.

3 BUILT-UP CORE LAMINATIONS Cores are constructed of 29 gauge, non-aging silicon steel. Individual laminations are insulated with a baked-on varnish. Since the entire core assembly is not treated in compound, the individual parts of the core can be disassembled and the coils removed.

4 ROUND TANKS Round tanks and covers are fabricated of heavy copper-bearing steel. Small tanks have rolled tops and large tanks have heavy flange tops. The reinforced tops provide thickness and strength against deformation when the complete transformers are lifted by lugs.

5 WET PROCESS PORCELAIN BUSHINGS As in Power Transformers the bushings in Distribution Transformers are manufactured of wet process porcelain, and are easily detachable.

WRITE FOR YOUR COPY . . . of our new Catalog. No. 142, on Distribution Transformers.

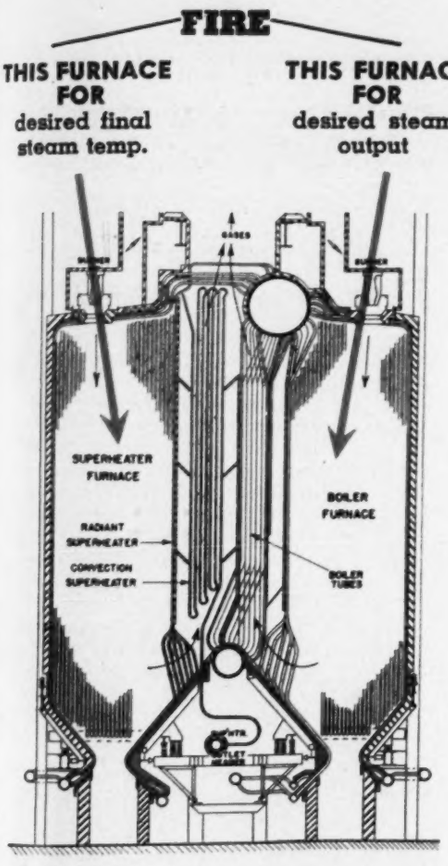
Pennsylvania TRANSFORMER COMPANY
PITTSBURGH, PENNSYLVANIA

Pennsylvania TRANSFORMERS

OPERATING ADVANTAGES OF TWIN FURNACES

1. WIDEST RANGE OF SUPERHEAT CONTROL
2. SLAG FREE OPERATION
3. OVERHEATING OF SUPERHEATER ELIMINATED
4. HIGH AVAILABILITY
5. LOW DRAFT LOST
6. HIGH RATE OF CIRCULATION

→because ALL STEAM GENERATION TUBES ARE AMPLY SUPPLIED WITH WATER—FLOW OF STEAM AND WATER IS UNRESTRICTED.



The high rate of circulation in Twin Furnaces is dependent on these inherent characteristics of design:

1. Downcomers are liberal in size.
2. Downcomers are unheated.
3. Separate downcomer manifold, independent of water wall headers, distributes circulating water to various walls.
4. Water delivered by downcomer manifold to each wall is evenly distributed by multi-connections uniformly spaced along length of all headers.
5. Sidewalls are composed entirely of steam generating tubes having uninterrupted flow to steam drum.

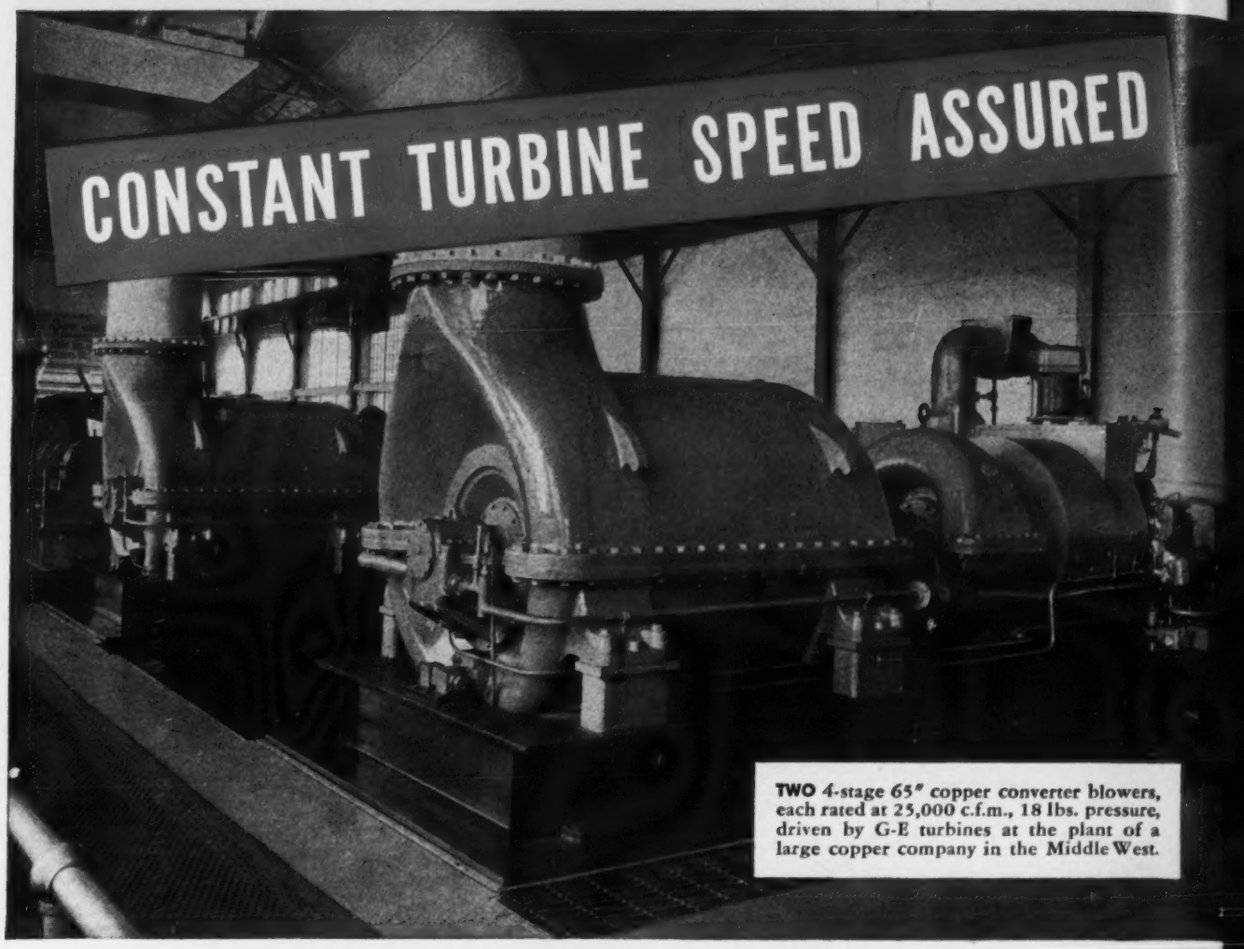
Performance tests have demonstrated that circulation at full load exceeds nine times evaporation.

The Army-Navy Production "E" has been awarded to Foster Wheeler in recognition of quality equipment, in quantity, on time.

FOSTER WHEELER CORPORATION

165 Broadway, New York, N. Y.

FOSTER WHEELER



TWO 4-stage 65″ copper converter blowers, each rated at 25,000 c.f.m., 18 lbs. pressure, driven by G-E turbines at the plant of a large copper company in the Middle West.

YOU can be certain of constant turbine speed when governors are instantly responsive to each slight fluctuation of load . . . by lubricating with *Texaco Regal Oil.*

Texaco Regal Oils rapidly free themselves from air and water. In long years of service, in thousands of turbines, they have shown maximum resistance to oxidation, emulsification, gum formation and sludging. They keep circulating systems cleaner, governors sensitive, bearing temperatures normal.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent turbine operators everywhere.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

TEXACO

TEXACO Regal Oils

FOR ALL TURBINES

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTL

"3 up, and 3 to come!" ...— and all ELLIOTT

Another large utility entrusts its boiler feed pump drives to these fine, big two-pole Elliott induction motors. The three in the photo are each of 800-hp. The three additional motors about to be shipped are of 1750-hp. Pretty substantial-looking units, and as good in performance as they are in appearance.

Elliott engineers have been developing this type of motor for over twenty-five years, and have achieved impressive results. A considerable number of important utilities have discovered this, and when they require big, high-speed motors, they talk it over with Elliott.

Full details in the bulletin — on request.

ELLIOTT COMPANY
Electric Power Dept., RIDGWAY, PA.
District Offices in Principal Cities

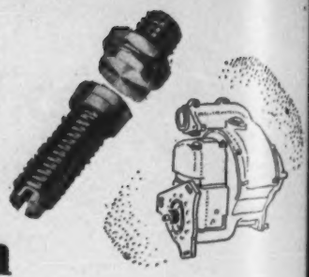
L-740

ELLIOTT MOTORS

For important drives

The Case of the Ailing Magneto . . .

Showing That Cooperation Can Lick Almost Any Contact Problem



When you add eagerness to cooperate to engineering experience and "know how," you will understand in some measure why such incredible production results are coming from industry's team work in the war effort. And that goes for any part—from gigantic casting to tiny contact point.

Nowadays, contact production ills demand quick action from the specialist, especially when the prescription must be virtually instantaneous.

Recently, Mallory had a hurry call for help with ailing aircraft magnetos. Combat planes were grounded by faulty magneto operation. Tests traced the trouble to contact "pitting" which caused the airplane engine to misfire.

Mallory contact engineers sought a better material. Speedy experiments indicated a standard Mallory alloy. Suitable contacts were designed, attached to proper backing and put on test. In a few days, the magneto manufacturer's contact troubles were over. The new contacts were incorporated in the magneto production line and magnetos no longer held up efficient combat plane production.

Some folk might hail this example of Mallory contact development as a success story. We prefer to regard it as an example of eager cooperation—the application of years of experience and "know how" that is merely part of the day's work for war effort.

We think we have learned a lot about contacts over the years—and we know we are adding to that knowledge with every development we make. Consult us when your designs involve contacts and complete contact assemblies.

While the design is still in blueprint form

CALL IN MALLORY *for Contacts and Contact Assemblies*

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA
Cable Address—PELMALLO

"*Two masts* in LINE ERECTION are:

1. GREATER SPEED!

2. LESS WASTE!"

OLIVER "SPEED-POINT" BOLTS

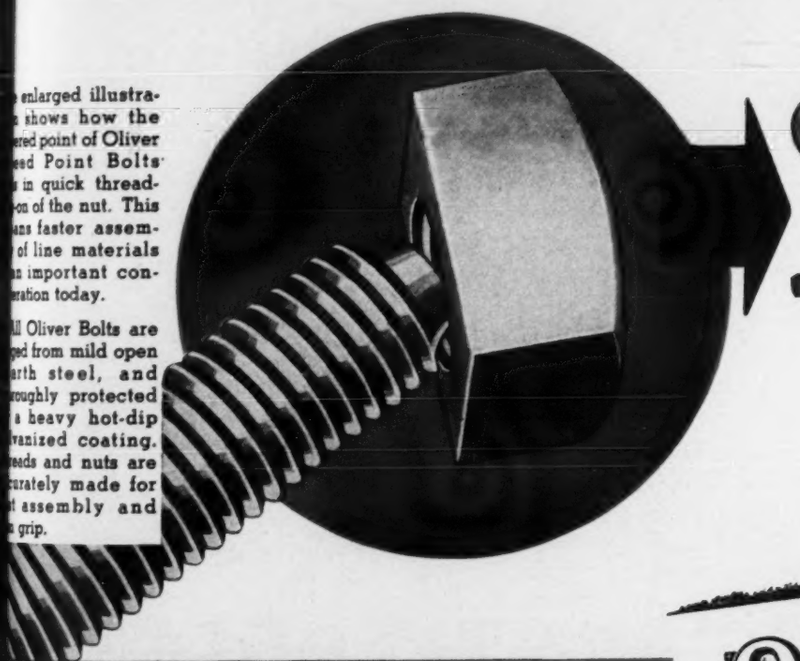
Help you meet both demands!

STER ASSEMBLY. You will find assembly of pole material faster when you use Oliver Speed Point , because (a) Nuts are threaded on more quickly any angle (b) Speed Point Bolts drive faster.

✓ **GREATER SALVAGE.** Oliver Bolts may be driven out of old holes and used over again without rethreading because the Speed Point construction prevents "mushrooming" of the points and damage to the lead threads.

enlarged illustra- shows how the ered point of Oliver eed Point Bolts' in quick thread- on of the nut. This ans faster assem- of line materials important con- ration today.

ll Oliver Bolts are ged from mild open arth steel, and roughly protected a heavy hot-dip vanized coating. eads and nuts are urately made for assembly and grip.

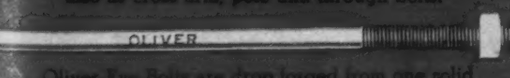


Double Arming Eye Bolts form an easy method for guying or dead-ending lines on double cross arms.

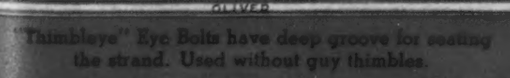
Double Arming Bolts provide an economical means of tying two cross arms together.

Oliver Carriage Bolts have square nuts, finished points and rolled threads, assuring good fit.

Oliver Machine Bolts are made in all sizes. Known also as cross arm, pole and through bolts.



Oliver Eye Bolts are drop forged from one solid piece of open hearth steel.



"Thimblaye" Eye Bolts have deep groove for seating the strand. Used without guy thimbles.

OLIVER
IRON AND STEEL
Corporation

Makers of Pole Line Materials Since 1894

PITTSBURGH, PENNSYLVANIA

Cooperating in War Production

HELPFUL INFORMATION
FOR USERS OF CRESCENT TOOLS

TOOL NOTES

Maintenance and Repair Suggestions to Prolong Tool Life

No. 7 NOTES ON USE AND CARE OF CRESCENT SNIPS

Crescent Snips are made in the four styles illustrated below. The *Standard* Pattern is the most generally used type and is designed for cutting straight lines or circles of fairly large radius. Available in 8 sizes, from 7 to 14" overall length. The *Combination* Pattern, designed after conventional "circular cutting" types, will cut curves as well as straight lines. Made in one size only with an overall length of 12-3/4". The *Heavy Duty* Pattern is a rugged, powerful leverage snip for heavy work. It will cut curves as well as straight lines. One size, 16-1/2" overall length. The *Circular Cutting* Pattern is designed especially for scroll work and intricate patterns. Two sizes, 7" and 12-3/4" overall length.

The terms Right or Left Hand *Snips* and Right or Left Hand *Cut* are often confused. A Right Hand *Snip* has a Left Hand *Cut*; i. e. it cuts to the operator's left of the top blade, thus enabling a right-handed operator to see the line of cut. The reverse is true of Left Hand Snips. All Crescent Snips are Right Hand Snips.

REGRINDING. The blade contour of Crescent Snips is the result of considerable research and experiment. It is so designed as to present an efficient shearing angle throughout the full length of the cutting stroke. When regrinding, it is therefore important to maintain the original blade contour. Grind only the bevel edge of the blade and only to an amount necessary to present a clean, sharp edge.

MAINTAIN THIS PROFILE
GRIND BEVELED EDGE ONLY
SECTION A-A

In reassembling the blades, take care not to overtighten the bolt. This caution applies particularly to Crescent U-412 and U-416 snips. Blade tension in all Crescent Snips is assured originally by grinding them openingly the blades to shape.

COMMON ABUSES. Overloading, by trying to cut stock beyond the capacity of the snip, or forcing the cut by hammering the handles, is poor practice. Cutting wire with snips, like-wise, constitutes abuse. This is particularly true with snips having inlaid blades although since Crescent blades are solid forgings and hardened clear through they are less likely to be damaged by this practice. With intelligent use and normal care, Crescent Snips will retain their clean shearing edges for a long time. Keep joint oiled at all times. Prevent rust by occasionally wiping with oiled cloth.

REPAIR PARTS. Bolts and nuts are available for all Crescent Snips. Snip "halves" cannot be supplied as they must be made up in pairs and matched at the factory.

HOW TO USE SNIPS. First mark or scribe the work to accurately locate the line of cut. With the cutting edge of the upper blade directly on the scribed line, begin the cut with the metal well back into the throat of the snips. Stop the cut just before you reach the end of the cutting stroke and repeat the operation by taking another full "bite". If you permit the snip to cut clean through on each stroke, a burred or ragged edge will result and it is more difficult to follow a scribed line. Standard Pattern snips are best for cutting long, straight lines as the flat inside surface of the blade acts as a guide.

When making short cuts of limited length, open the jaws just far enough to permit the desired length of cut. Then cut through with one stroke to the end of the blade. To cut an inside curve, first drill or punch a hole of sufficient size to permit entry of the blade tip. Then gradually spiral out to the scribed line as indicated in the illustration above.

STANDARD
HEAVY DUTY
COMBINATION

CRESCENT TOOLS
Give Wings to Work

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

TOOL NOTES
No. 7 NOTES ON USE AND CARE OF CRESCENT SNIPS
No. 3 CRESCENT REPAIR PARTS PROLONG TOOL LIFE
No. 4 THE USE AND CARE OF CRESCENT CUTTING PLIERS
No. 5 THE USE AND CARE OF CRESCENT CHAIN WRENCHES
No. 8 HOW TO USE CRESCENT NAIL PULLERS
CRESCENT TOOLS
Give Wings to Work

CRESCENT TOOL CO., JAMESTOWN, NEW YORK

● Crescent's informative series entitled "TOOL NOTES" has been reprinted and is now available in portfolio form. The set consists of 8 sheets, 8½ x 11", punched for standard 3-ring binder and stapled between serviceable covers.

Subjects covered are as indicated by the 8 sheets illustrated on this page. Copies will be furnished gratis to users and purchasers of Crescent Tools, and in limited quantities to trade and vocational schools, both civilian and military. For classroom and bulletin board use, individual sheets can be supplied less covers.

To obtain these reprints, write us direct, stating whether those we send you should be in portfolio or loose sheet form.

Technically-informed supplier of electronic materials . . .

BUY U.S. WAR BONDS

Your local RCA TUBE and EQUIPMENT DISTRIBUTOR

'ROUND-THE-CORNER SERVICE!

Following are but a few of the electronic items regularly handled by your local RCA Tube and Equipment Distributor:

RCA, CUNNINGHAM, and RCA VICTOR RADIO TUBES

RCA SPECIAL PURPOSE TUBES

RCA POWER TUBES, PHOTOTUBES, CATHODE RAY TUBES, etc.

RCA ELECTRONIC TEST EQUIPMENT

. . . also condensers, resistors, rheostats, controls, potentiometers, coils, transformers, wire, and numerous other radio and electronic components produced by many manufacturers.

Making war equipment that necessitates frequent calls for tubes and other electronic components?

Then get acquainted with your *local* RCA Tube and Equipment Distributor today!

He may have just what you need in stock for immediate delivery upon receipt of a suitable priority. If he doesn't, he is well equipped to get it for you as fast as circumstances permit—and to render an intelligent, personalized expediting service all along the line.

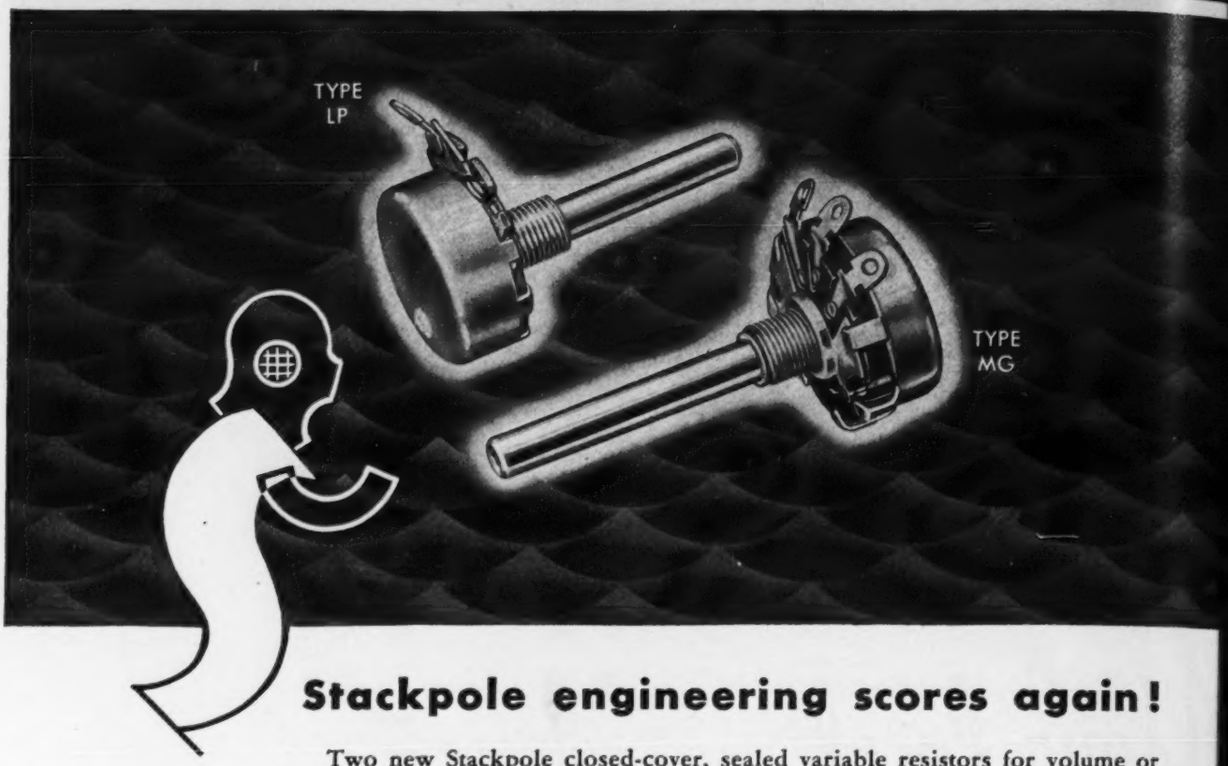
Equally important is his technical knowledge. He has been dealing with things electronic since the "knee pants" days of radio. He knows what to use and how to use it. You'll find his technical advice and recommendations a big help.

There are over 300 RCA Tube and Equipment Distributors throughout the country. Write or wire for a list of those nearest you.

RADIO CORPORATION OF AMERICA
RCA Victor Division, Camden, N.J.

AN ADVERTISEMENT OF THE RCA TUBE AND EQUIPMENT DIVISION IN THE INTEREST OF GREATER SERVICE AND EFFICIENCY IN PRIORITY-COVERED WAR MATERIALS BUYING

SEALED VARIABLE RESISTORS
TO MEET HIGHLY HUMID OR DUSTY CONDITIONS



Stackpole engineering scores again!

Two new Stackpole closed-cover, sealed variable resistors for volume or sensitivity use, meet today's demand for units which will perform faithfully anywhere from the world's wettest, most humid places to its dustiest, sandiest spots—and in either standard radio or high frequency equipment.

The Type MG Variable Resistor is designed for extremely humid or salt spray conditions and for use in equipment where internal and external leakage must be held to a minimum. Actually, its leakage resistance is on the order of 300 meg. after 48 hours in 95% humidity at 40° C.

The famous Stackpole Type LP Variable Resistor is now furnished with a dust-proof cover and effectively sealed with a special compound to the point where resistivity from current carrying parts after 48 hours of 95% relative humidity at 40° C. is five times that of the previous open construction resistors.

STACKPOLE CARBON COMPANY, ST. MARYS, PENNA.

MOLDED RARE METAL CONTACTS

...also carbon, graphite and composition types

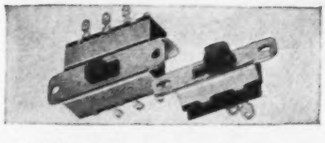
CARBON PRODUCTS

Brushes (for all rotating machines) —Anodes — Electrodes — Brazing Blocks—Bearings—Welding Rods, Electrodes and Plates—Pipe—Packing, Piston and Seal Rings — Rheostat Plates and Discs—Brake Lining, etc.

• • •

Sold to manufacturers only—Catalog and samples upon request

STACKPOLE



SWITCHES Slide operated (either indexed or momentary contact type)—Rotary Index and Toggle types.

RESISTORS *(fixed or variable)* Carbon composition resistors, fixed types up to 4 watts. Variables in 4 different types.

IRON CORES Molded from powders in a variety of grades and sizes and for use at frequencies to 150-175 meg.

Nature

MADE CEDAR POLES LIGHT, STRONG, STRAIGHT

NOW

Science

Has Added an EXTRA SPAN OF SERVICE LIFE!

LIFE-

Life Span

SPAN

TOX-I-TIZED

CEDAR POLES

Sold only by the following:

PAGE & HILL CO., Minneapolis, Minn.
50 Church St., New York, N. Y.

SCHAEFER-HITCHCOCK COMPANY
Sandpoint, Idaho—Supplier for Joslyn

GAVITT-NAUGLE CO., Spokane, Washington
205 West Wacker Drive, Chicago, Ill.

NAUGLE POLE AND TIE CORP.,
Minneapolis, Minnesota

In straightness, proportion, soundness and other factors that go to make good pole structure, cedar has proved itself unmatched among pole timbers. To these natural advantages of cedar pole, science has now added extra years of dependable service. Through application of a highly toxic chlorinated phenol preservative, the durability of cedar heartwood has been brought to the surface. All Life-Span Cedar Poles receive a full-length toxitizing treatment in addition to the regular creosote butt treatment. This provides full-length protection against rot organisms and insects with double protection at the ground line. Life-Span Cedar Poles mean long range power line economy. They are ideally fitted not only for today's big job but for the vital power and communication needs of the future.

CONSOLIDATED TREATING CO.

Minneapolis Minnesota

TRADE MARK
Standard TRANSFORMERS i
20—500 KVA, Type A Oil Immersed self-cooled Distribution Transformers, 50 cycle, single phase, 11,000 V primary, with four 5% taps below normal, to 230/460/400Y V secondary; 45 deg. C rise.
THE S

in Service Around the Globe

To meet the rapidly expanding power needs of our armed services Standard Power Transformers are being shipped to all corners of the earth. Today Standard Transformers are on 24-hour service in Naval Stations, in Army Camps, in Troop Concentration Camps around the Globe.

Designed for a specific service—developed to save critical materials and built by an experienced organization, Standard Transformers are meeting the unusual power demands of a Nation at War.

The in-built quality of Standard Transformers, so essential to War time operations, will continue to serve your power transmission lines for the duration and for many years to come.

For quick action, consult a Standard Representative on your transformer needs.

Recently increased engineering facilities are illustrated at right. This group of Engineers is thoroughly familiar with all transformer-design and engineering problems encountered in today's production drive. Their services are available to help you solve your problems.

STANDARD TRANSFORMER CO.
WARREN, OHIO, U.S.A.

No repairs to lubricated parts in 5½ years operation with **Gulf Diesel lubricating oil!**

Actual photograph of a Gulf Lubrication Service Engineer obtaining a firing diagram to check combustion on one of the three 1,000-hp. Winton Diesels with which the plant is equipped. No repairs of any kind have been necessary to lubricated parts since Gulf quality lubricants were put in service in 1937.

THIS power plant has saved a lot of money during the past 5½ years with Gulf lubricating oil in service in its three Diesels. For no repairs of any kind have been necessary to lubricated parts during this period, and today the engines are essentially in as good condition as when this quality Gulf oil took over the lubricating job.

This is a typical performance record of tough-filmed and stable Gulf Diesel lubricating oils. In plant after plant, these quality oils are helping set higher standards of Diesel operating efficiency and economy.

If you feel that there is room for improvement in the operating or maintenance figures shown in your records, ask a Gulf lubrication service engineer to call. His thorough training and broad experience with many types of Diesels is your assurance of sound recommendations which will help you get more efficient performance and lower maintenance costs.

The services of a Gulf engineer—and the Gulf line of quality Diesel lubricating oils—are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

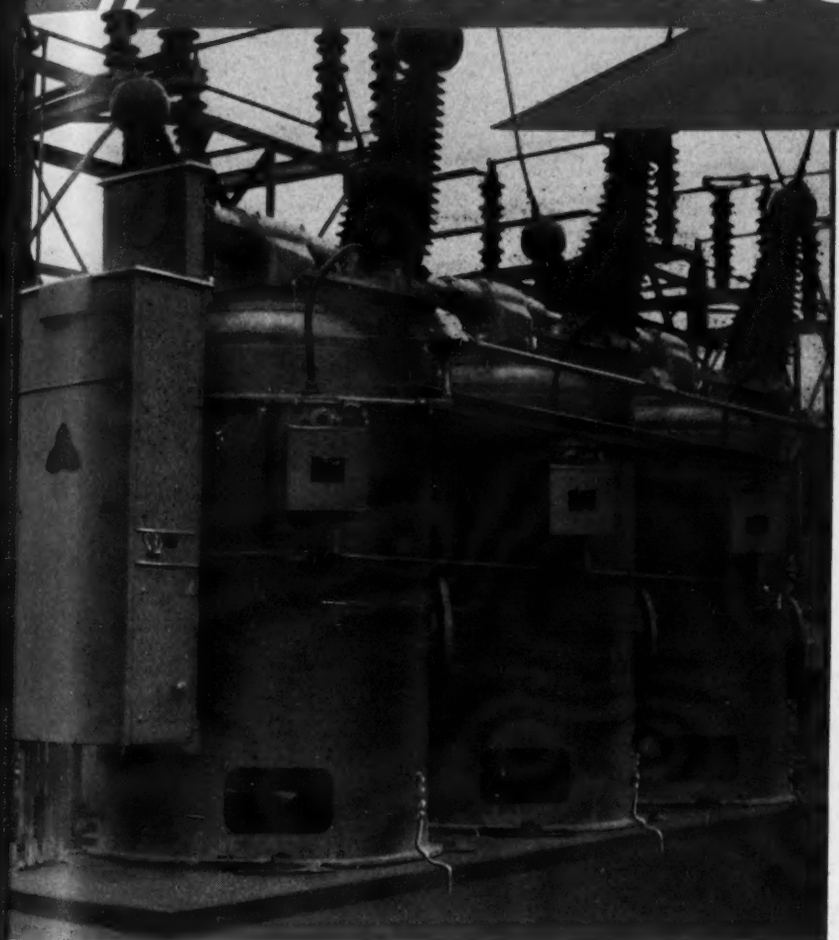
GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH, PA.

Protection from Unwanted Blackouts

with

PACIFIC ELECTRIC BREAKERS



Reliable, Trouble-Free—Assured by 37 Years of Specialized Manufacturing

Type RWE, 115 to 287 kv.

Production today demands full protection from outages.

Here are reliable, trouble-free breakers needing the minimum of upkeep.

Made by the Pacific Electric Mfg. Corporation, you benefit from their 37 years of specialization in high-voltage switching equipment of *proved* design. There are 6 breaks per pole, with Expulsion Chambers which extinguish arcs quickly and thereby save contacts, save oil deterioration, reduce tank pressures and assure longer carefree protection.

These breakers offer fast opening, reclosing and perfect synchronizing at a reliable constant operating speed from our Motor-Wound Spring-Actuated Motor Control.

All of this has proved true at scores of Pacific Electric Breaker installations throughout the nation.

You get great mechanical strength and perfect alignment . . . accurate blade motion from the Bevel-Link Drive. Ask for all the details which assure full protection from unwanted blackouts.

Closes on AC Current without Rectifiers—Small Operating Power Needed—Fast Manual and Electrical Closing

The Pacific Electric Motor Control has a strong spring automatically motor-wound from low AC or DC current and stores power for *fast* interruptions and reclosures. Manual reclosing is just as fast as electrical. There are no expensive station batteries, no heavy cables, no short-life rectifiers. Write for more facts about Pacific Electric Breakers and why their utility-tested design is so reliable.

C. H. Cutter
1015 Securities Bldg.
Seattle, Wash.

U. N. Halliday
230 U. S. Nat'l Bank Bldg.
Denver, Colo.

Filbert & Fredericks
90 West St.
New York, N. Y.

G. B. Kirkwood
437 S. Hill St.
Los Angeles, Calif.

J. E. Redmond Co.
448 W. Madison St.
Phoenix, Ariz.

A. A. Marrs
526 Dwight Bldg.
Kansas City, Mo.

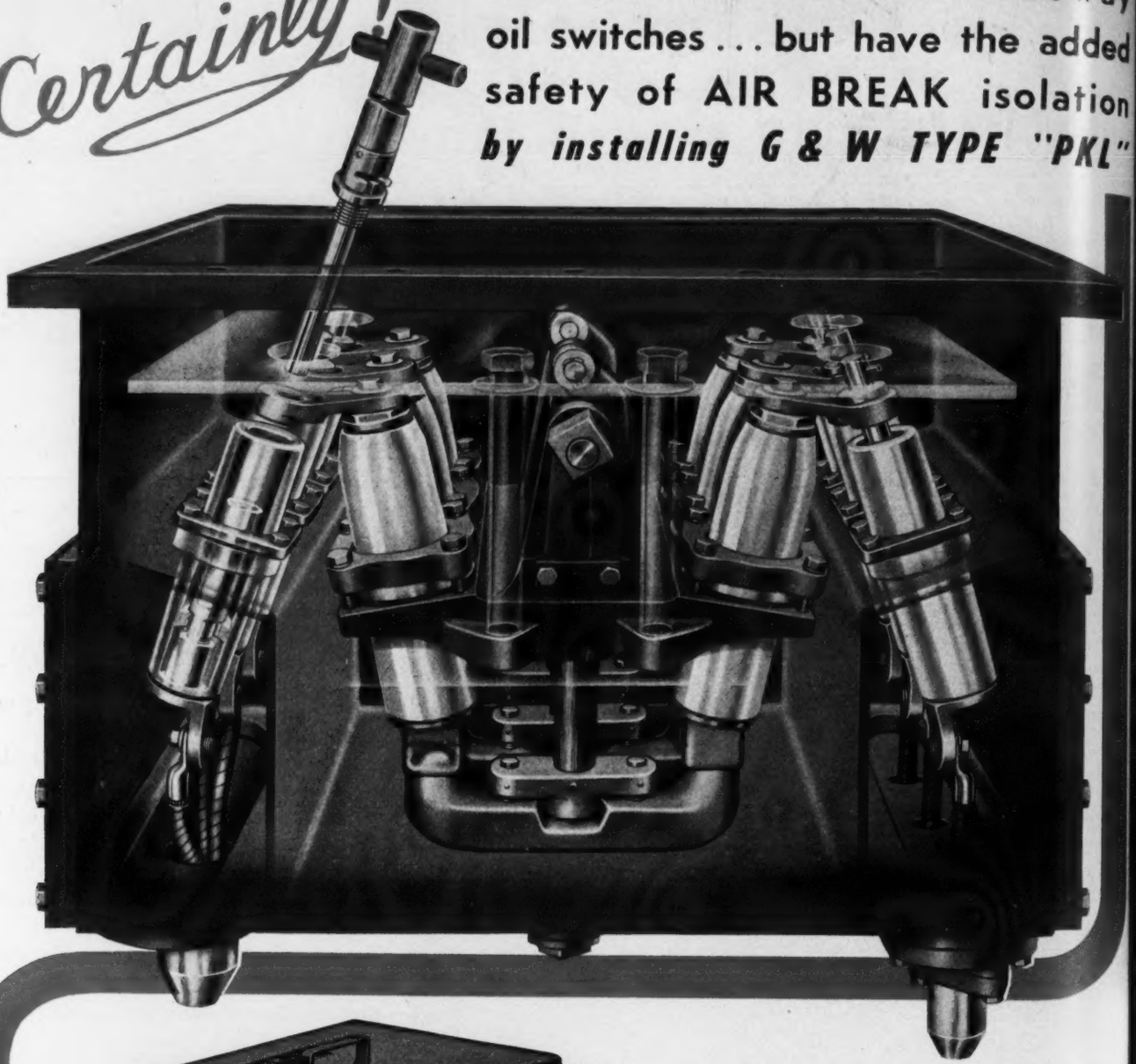
Other Representatives in Principal Cities

Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

Certainly!

Use full load break subway oil switches . . . but have the added safety of AIR BREAK isolation *by installing G & W TYPE "PKL"*



You get greatly increased flexibility in your distribution system, greater ease of maintenance, and utmost safety — when you install G & W Type "PKL" Air and Oil Break Switches.

You can quickly isolate the underground cable circuit in case of trouble, or when changes and extensions are required.

With an air break disconnection on either side of the oil switch, you simply withdraw the plug connectors to leave definite air separation between oil switch contacts and cable terminating contacts. The switch is then isolated for inspection, and the cables can be given attention with entire safety. The insulating shield at the top is transparent "Plexiglas".

Send for Bulletin 404

G & W ELECTRIC SPECIALTY CO.

7780 DANTE AVENUE, CHICAGO, ILL., U. S. A.

Also made in Canada by Powerlite Devices, Ltd., Toronto

G&W ELECTRIC CABLE DEVICES

POTHEADS . . . BOXES . . . OIL FUSE CUTOUTS . . . OIL SWITCHES AND MULTIPLE CIRCUIT OIL DISCONNECTS

NO QUESTIONABLE PORCELAIN CAN SURVIVE THIS TEST

Lapp suspension insulator units, before being approved for shipment, must withstand the Overpotential Test, the industry's most severe test of porcelain quality. Its rim immersed in oil to prevent flashover, the unit is subjected to 60 cycle current at voltage higher than rated flashover value. Porcelain not up to the Lapp standard, punctures in this test, never gets a chance to fail on your lines. Units that survive are assured a definite dielectric factor of safety. The Overpotential Test is one of the many reasons that you do better with Lapp insulators on your lines. May we tell you the whole story? Lapp Insulator Co., Inc., LeRoy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

WESTINGHOUSE NEW DRY-TYPE TRANSFORMERS

36% copper saving . . . 50% steel saving . . . *and a better transformer!* That is the new Westinghouse Dry-type Distribution Transformer. (Ratings from 1 to 100 Kv-a.)

Three things make this transformer possible:

1. **HIPERSIL*:** the new Westinghouse electrical steel that has one-third more flux-carrying capacity . . . saves copper and steel.
2. **CLASS B INSULATION:** permits more Kv-a output with less copper in the windings.
3. Westinghouse Engineering "KNOW-HOW" in pioneering and combining new developments into practical critical material-saving transformers.

The smallest and lightest indoor distribution transformer ever built, this new Westinghouse design adds to the inherent advantages of Dry-Type Transformers:

- **SPACE SAVING . . .** Mount a dry-type anywhere indoors . . . on a shelf, a post, or overhead.
- **TIMESAVING . . .** No fireproof vaults required.
- **IMPROVED VOLTAGE REGULATION and COPPER SAVING . . .** Located at the machine, the dry-type eliminates long heavy secondary runs.
- **NO LIQUIDS** to inspect, change or filter.

J-70399

Ask your Westinghouse Representative for full details on this lighter and smaller transformer. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

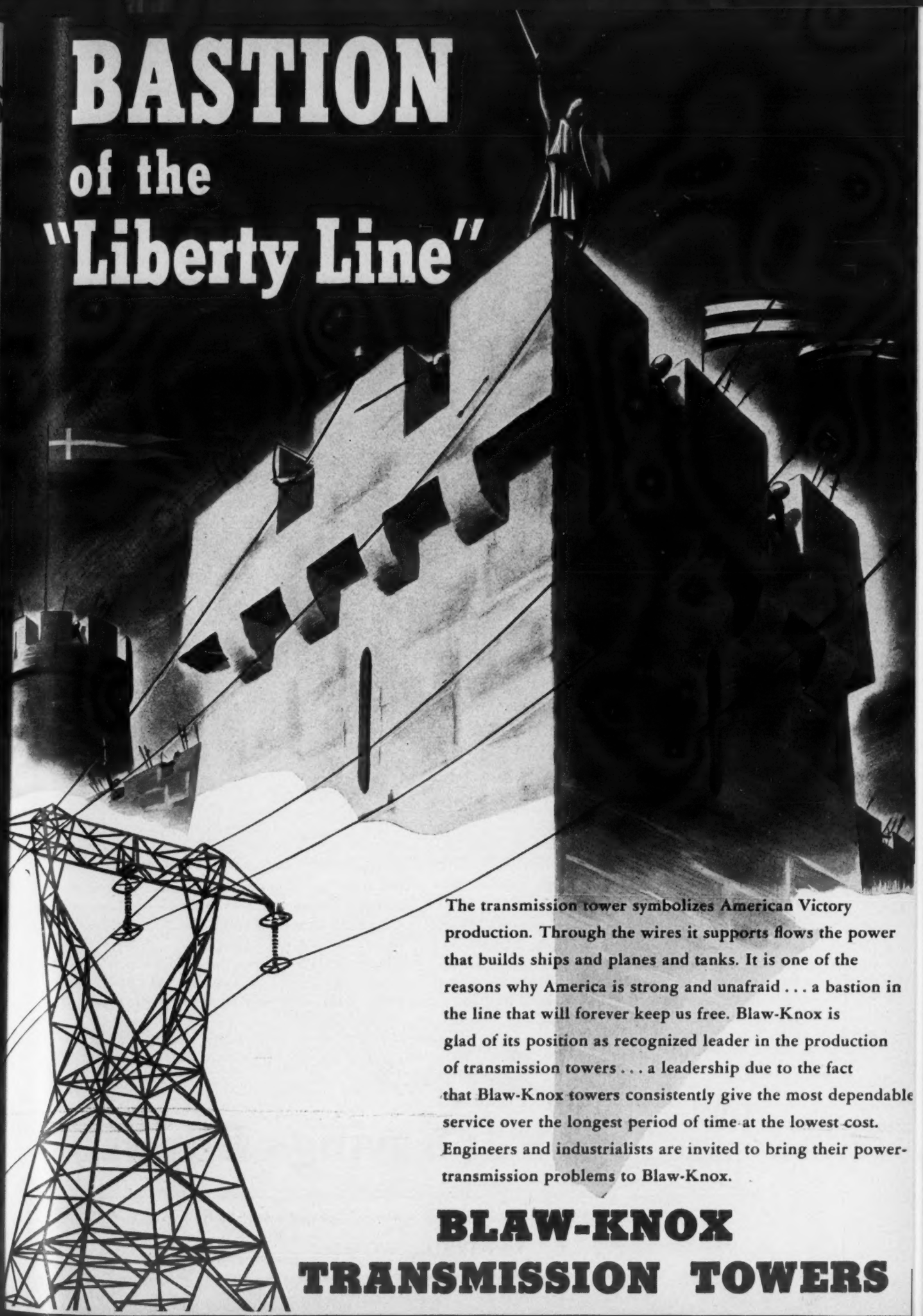
*Registered trade-mark, Westinghouse Electric & Manufacturing Company, for HIgh PERmeability SILicon steel which carries ½ more flux.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

DISTRIBUTION TRANSFORMERS

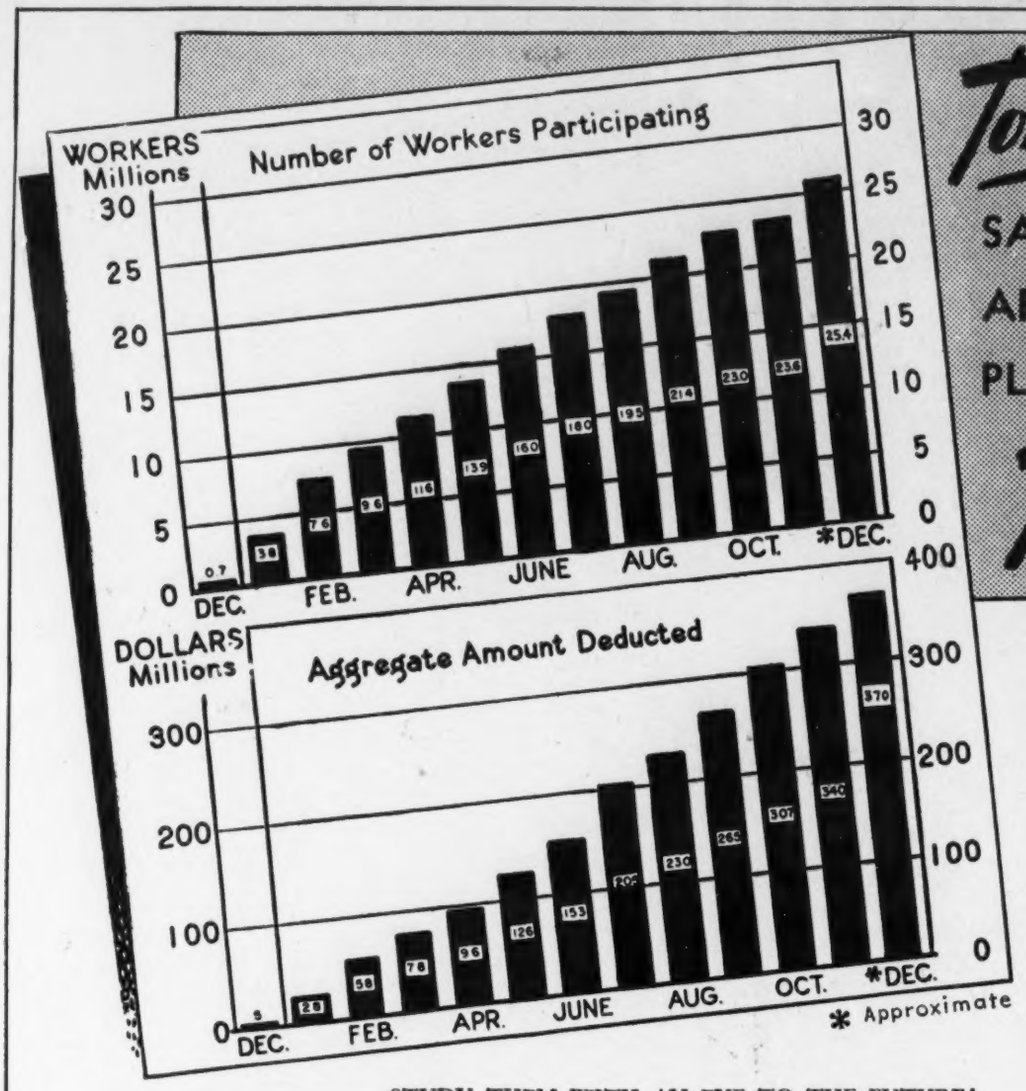
BASTION of the "Liberty Line"



The transmission tower symbolizes American Victory production. Through the wires it supports flows the power that builds ships and planes and tanks. It is one of the reasons why America is strong and unafraid . . . a bastion in the line that will forever keep us free. Blaw-Knox is glad of its position as recognized leader in the production of transmission towers . . . a leadership due to the fact that Blaw-Knox towers consistently give the most dependable service over the longest period of time at the lowest cost. Engineers and industrialists are invited to bring their power-transmission problems to Blaw-Knox.

BLAW-KNOX TRANSMISSION TOWERS

AW-KNOX DIVISION OF BLAW-KNOX COMPANY 2013 FARMERS BANK BUILDING, PITTSBURGH, PA
NEW YORK • CHICAGO • PHILADELPHIA • BIRMINGHAM



Tomorrow's SALES CURVES ARE BEING PLOTTED . . . Today

THESE CHARTS SHOW ESTIMATED PARTICIPATION IN PAYROLL SAVINGS PLANS FOR WAR SAVINGS BONDS *(Members of Armed Forces Included Starting August 1942)*

STUDY THEM WITH AN EYE TO THE FUTURE!

There is more to these charts than meets the eye. Not seen, but clearly projected into the future, is the sales curve of tomorrow. Here is the thrilling story of over 25,000,000 American workers who are today voluntarily saving close to FOUR AND A HALF BILLION DOLLARS per year in War Bonds through the Payroll Savings Plan.

Think what this money will buy in the way of guns and tanks and planes for Victory today—*and mountains of brand new consumer goods tomorrow.* Remember, too, that War Bond money grows in value every year it is saved, until at maturity it returns $4 for every $3 invested!

Here indeed is a solid foundation for the peace-time business that will follow victory. At the same time, it is a real tribute to the voluntary American way of meeting emergencies that has seen us through every crisis in our history.

But there is still more to be done. As our armed forces continue to press the attack in all quarters of the globe, as war costs mount, so must the record of our savings keep pace.

Clearly, on charts like these, tomorrow's Victory —*and tomorrow's sales curves*—are being plotted today by 50,000,000 Americans who now hold WAR BONDS.

EVERYBODY EVERY PAYDAY AT LEAST 10%

Save with

War Savings Bonds

This space is a contribution to America's all-out war effort by

ELECTRICAL WORLD

VIRTUALLY every section of the country is dotted with American Bridge transmission towers — over 60,000 of them—carrying a large portion of the vital electrical energy that turns the wheels of America's war plants.

You don't hear much about these towers. The very fact that they stay out of the news is mute testimony of their year-after-year reliability. Utilities have learned to count on American Bridge towers as a means of assuring continuity of electrical service and low maintenance. And they have learned that these individually engineered structures serve equally well for transmission across difficult mountainous terrain, or over rivers, deserts and wide plains.

Through these war years, as in every year since 1905, each transmission tower we design and fabricate is given the benefit of specialized engineering. One entire plant is devoted to the fabrication and galvanizing of transmission towers. It is equipped with the country's most modern test frame for proving even the largest line towers in use.

As each new American Bridge tower goes to its war assignment, we can offer just that much more engineering and construction experience for meeting your postwar planning and peacetime needs.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit · Duluth
Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

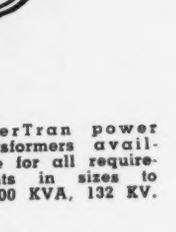
Improved Transformers

ELECTRICAL DESIGN
MECHANICAL FEATURES
PLANT CAPACITY
MANUFACTURING FACILITIES

AMER TRAN

AmerTran power transformers available for all requirements in sizes to 10,000 KVA, 132 KV.

AmerTran distribution transformers of either oil- or noninflammable - liquid - immersed type available in sizes to 500 KVA, 72 KV.



AmerTran air-cooled transformers for either indoor or outdoor service are available for all industrial requirements—sizes to 150 KVA.

You who are engaged in War work and are fortunate in obtaining AmerTran transformers — you know that some important improvements have been made to these products which have so long proved dependable for all manner of installations by electric utilities and industrial plants. You know that they are new in electrical design—new in many mechanical features. The service these new AmerTran products are performing for war-time industry will never be forgotten—and will give them even greater acceptance in peace time. AmerTran products are engineered and manufactured to meet the specific requirements of their users. Our 42 years of experience—and service to the electrical industry—is standing us in good stead —today. We look forward to resuming all of our former commercial relationships—in peace time.

AMERICAN TRANSFORMER COMPANY, 178 Emmet St., Newark, N. J.

Manufactured Since 1901 at Newark, N. J.

AmerTran transformers are manufactured to meet your exact electrical and mechanical requirements.

AMERTRAN

"Three ℰ" ISOLATORS

Require ⅓ the SPACE

SPACE IS AT A PREMIUM IN PLANTS AND SUBSTATIONS

The opening and closing of the ISOLATOR occurs through telescoping action of the contacts and current carrying parts as well as insulation. The installation space, therefore, need be no more than the actual overall dimensions of the ISOLATOR, THERE IS NO SWINGING BLADE ACTION THAT REQUIRES LARGER HOUSING. Because of this telescoping action it is possible to install the ISOLATOR into a most compact space.

The overall width of the ISOLATOR is also considerably less than that of the disconnect for the same phase clearance due to the additional insulation between phases, obtained by the telescoping ISOLATOR bushings.

ISOLATORS are shipped from the factory as completely assembled units, and can be QUICKLY INSTALLED as it is necessary only to insert four mounting bolts, then make and tape connections.

The ISOLATOR, due to its compactness, is often used in existing cells and bus structures where only hook stick operated, single pole switches could formerly be used. This means INCREASING CAPACITY and modernizing of disconnect equipment WITHOUT INCREASING SPACE.

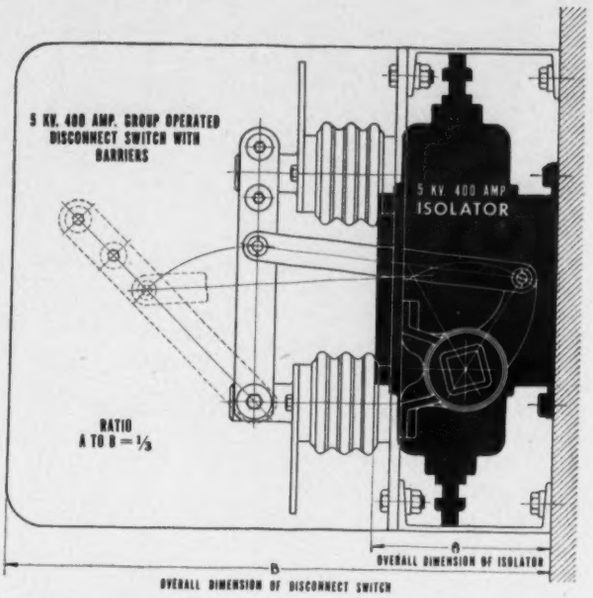
The live exposed current carrying parts of a group operated switch are always a hazard. The current carrying parts of the ISOLATOR are completely enclosed in insulation, whether in open or closed position leaving NO LIVE EXPOSED PARTS.

Standard units readily fit into the majority of indoor and outdoor uses as the ISOLATOR is built in a great variety of sizes, shapes and mountings.

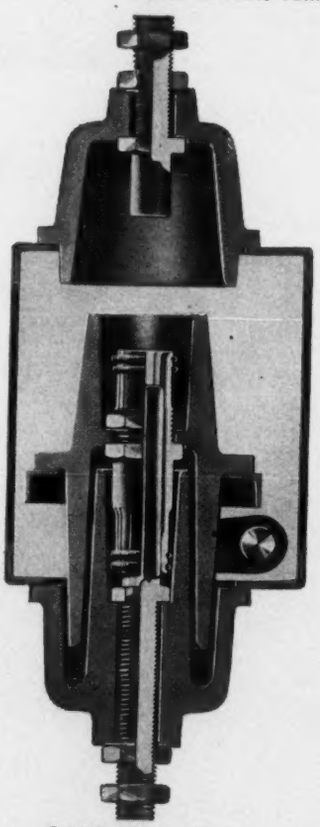
Supplied in ampere ratings of from 200 to 3,000 and voltages up to 15,000.

●

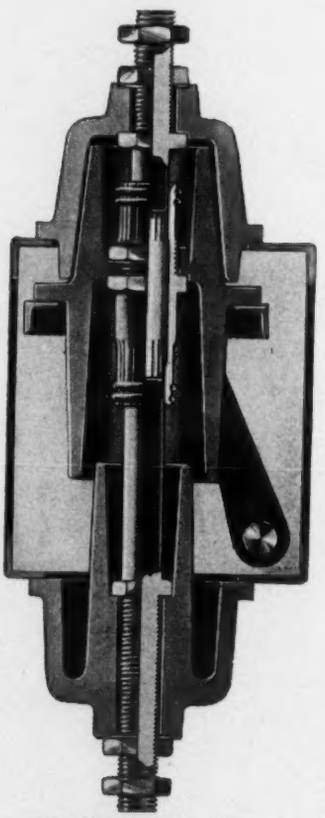
LICK SCARCITIES AND STILL KEEP *Engineering* STANDARDS HIGH


5 KV. 400 AMP. GROUP OPERATED DISCONNECT SWITCH WITH BARRIERS
5 KV. 400 AMP ISOLATOR
RATIO A TO B = ⅓
A
OVERALL DIMENSION OF ISOLATOR
B
OVERALL DIMENSION OF DISCONNECT SWITCH

Above phantom drawing shows relative space occupied by ISOLATOR in contrast with switch of same rating.

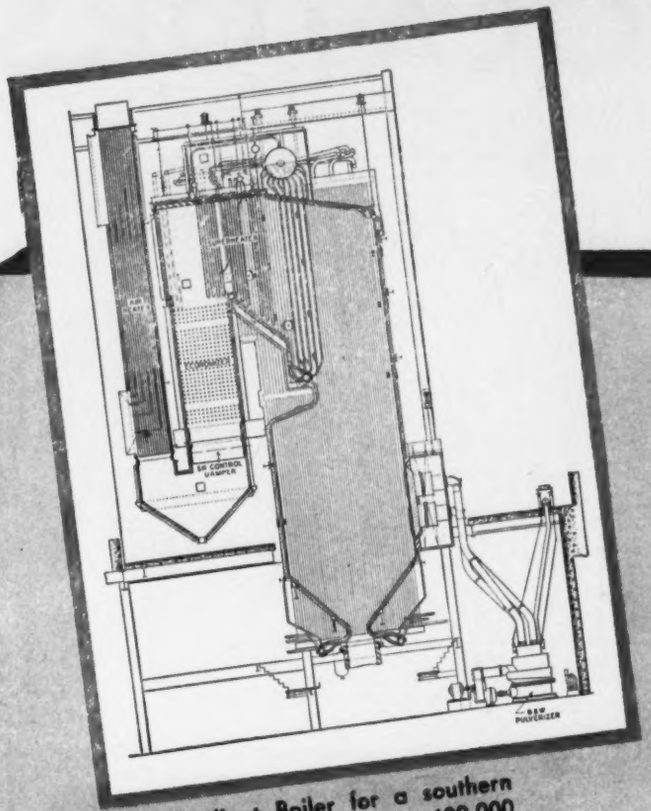


OPEN POSITION
Note visible open gap.

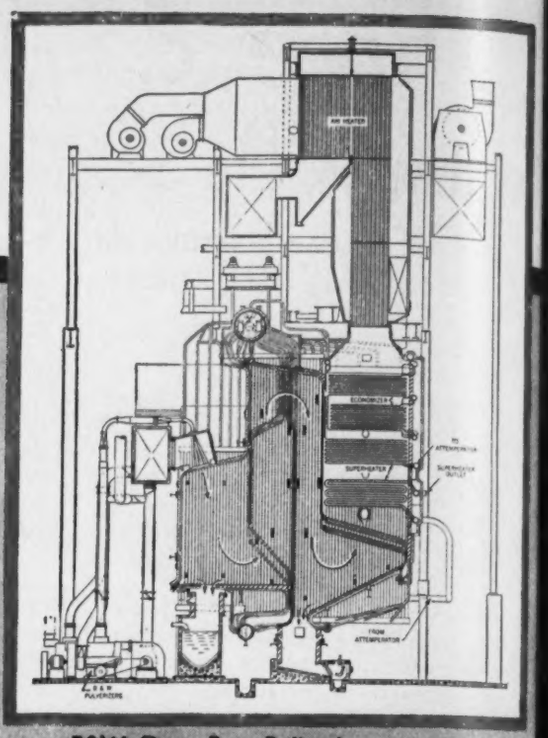


CLOSED POSITION
Contact made with no overall dimensional changes.

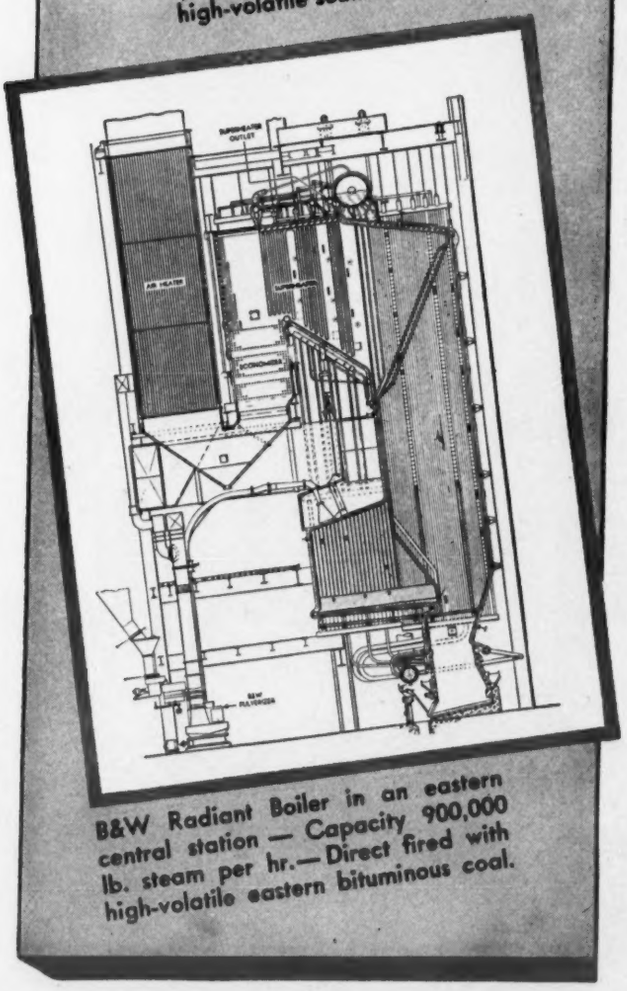
ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK ILLINOIS



B&W Radiant Boiler for a southern central station — Capacity 400,000 lb. steam per hr.— Direct fired with high-volatile southern bituminous coal.



B&W Open-Pass Boiler in an eastern central station— Capacity 350,000 lb. steam per hr.— Direct fired with high-volatile eastern bituminous coal.



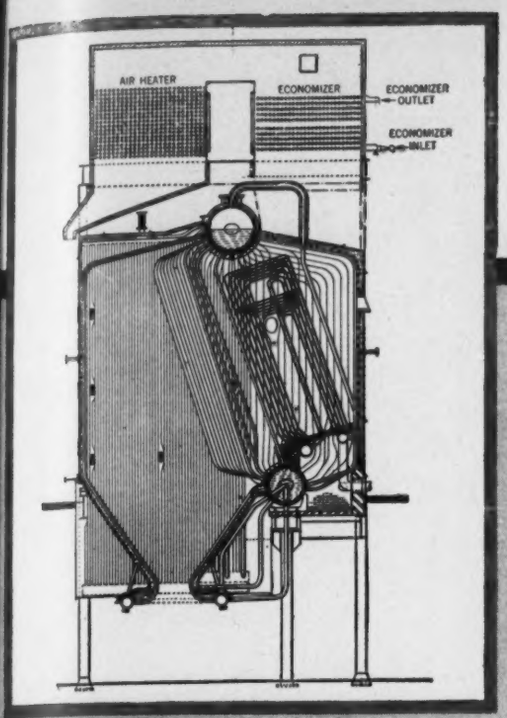
B&W Radiant Boiler in an eastern central station — Capacity 900,000 lb. steam per hr.— Direct fired with high-volatile eastern bituminous coal.

COAL MEETS THE FU

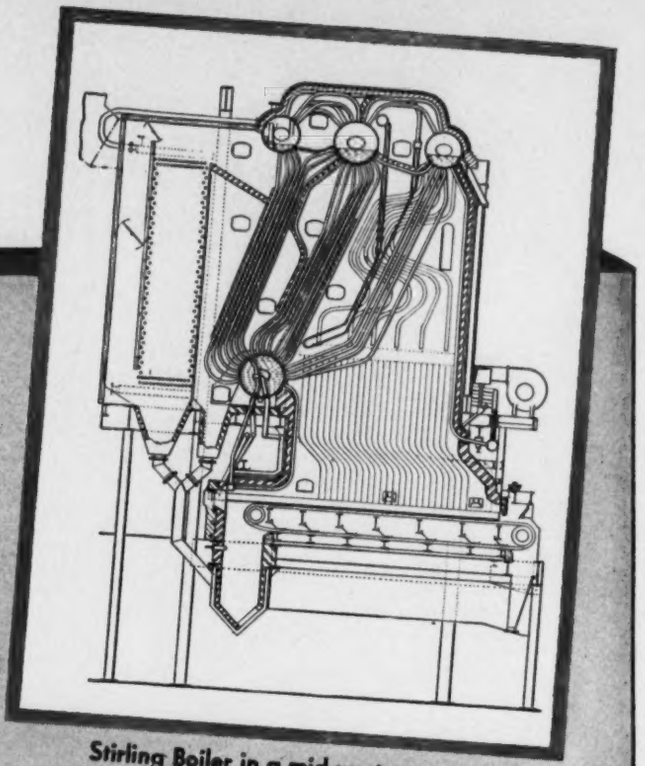
Pulverized and St

Steam plants today must be operated in the interes especi of the war effort, releasing from use the fuels needed plete by combat units. This has placed on coal the burden B&W of carrying today's production load. With coal, as econo with other fuels, it is vital that it be burned economi- acter cally and with minimum interruption to service. In the These field of coal burning, B&W can be of great service are se to coal users, because of its invaluable knowledge B&W and experience in the combustion of this and other the di fuels and through the coal-burning equipment it has ments made available. struct

The B&W Direct-Firing System is the result of the bustio Company's lengthy experience with pulverized-coal Co firing, an experience that dates back to the earliest on the applications to power boilers. This system is fully and t coordinated, from bin to burners; the ball-bearing the m type pulverizer and rotating-table feeder being



B&W Integral-Furnace Boiler for an eastern central station — Capacity 150,000 lb. steam per hr. — Direct fired with high-volatile Kentucky bituminous coal.



Stirling Boiler in a mid-western municipal electric light plant — Capacity 125,000 lb. steam per hr. — Fired with high-volatile Indiana bituminous coal on a B&W Chain-Grate Stoker.

FUEL EMERGENCY-
Stoker Firing

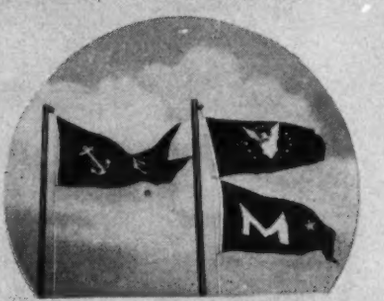
especially applicable to direct firing and to complete automatic control.

B&W Chain-Grate Stokers are widely used where economic considerations, size of boiler, and character of coal available make stoker firing advisable. These stokers burn a wide range of coals efficiently, are self-cleaning and low in maintenance.

B&W Water-Cooled Furnace Constructions have the diversity necessary for satisfying all the requirements of any method of firing, from supplying structural shape and strength, to promoting combustion and ash elimination in individual furnaces.

Complete B&W Boiler Units, such as those shown on these pages incorporating either method of firing and typical B&W Furnace Constructions, provide the means of meeting present-day fuel problems.

G-235T



The Maritime Victory flag and "M" burgee now float proudly alongside the Navy "E" at the Barberton Works. Each is an award for "outstanding achievement" and is "an honor not lightly bestowed".

BABCOCK & WILCOX

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK, N.Y.

Enough man-days were lost through accidents last year to have produced 300,000 light tanks. To help minimize such losses, this Company has subscribed to the National Safety Council's War Production Fund to Conserve Man Power.

"Rub-Less"
WIRE

"FIRE-STOP"
"SAFECOTE"
"MARKED — MEASURED"
"Dilec"

"Rub-Less"
WIRE
Emergency

No tin
No Rubber
No Synthetic

NATIONAL ELECTRIC PRODUCTS CORP.
HAZARD INSULATED WIRE WORKS
(DIVISION OF THE OKONITE COMPANY)
JOHN A. ROEBLING'S SONS CO.
UNITED STATES RUBBER CO.

Just in Case There Is a Brown-out

What has happened to the brown-out that was originally expected to begin around the first of this month? Will we still get it and, if so, for what reason?

There can be but three reasons for establishing this mild form of power rationing—power shortage, or coal shortage, or transportation shortage. There can be no question, however, of a power shortage. The figures as published in ELECTRICAL WORLD for January 23 indicate more power in reserve than at the time of Pearl Harbor.

Is it coal, then? Certainly not in utility coal piles, for these are the largest ever—nearly four months. Secretary of Interior Ickes has urged the greater use of coal, and when insisting that oil users turn to coal there was not the slightest intimation of any need for conservation. In fact, it is more than likely that Mr. Ickes would prefer to have any shortage onus placed on power rather than coal. He has oil on his hands now and wouldn't care to have another of the industries he is supposed to watch over get on the short list. If it did, somebody might ask why his projects seem to be so poorly prepared to meet the demands of war.

Transportation, of course, is critical in spite of the superb job of haulage that has been done by the American railroads. But if it is so critical that some other commodity of which there is plenty, like electricity, must be rationed, then why hasn't somebody worked out a plan for eliminating all non-essential haulage?

The utilities naturally do not like to lose revenue, as they would from the brown-out, but that is immaterial if such rationing is necessary. Whether it has been money to provide an adequate supply of power, or losing trained engineers and operators, or giving up some pet method or some apparatus on order, or converting from oil, or expanding the coal pile, the utilities have asked but one question—will it help the war effort?

In other words, if there is to be a brown-out to save fuel or transportation, or both, it should be so stated and the necessity therefor sold to the public. The utilities will actively cooperate in the taking of that program to the public, especially if they know that conservation is to be practiced by all industry. On the other hand, if they alone are singled out for rationing, when they have plenty, they cannot be criticised if they think that the brown-out is merely another political scheme for the purpose of reducing their revenues.

We hope that the power branch of WPB, which will have to give the brown-out order, if any is given, will insist on proof from either Mr. Ickes or Mr. Eastman, or both, that it is necessary and to what degree, and that they will also say what others are sharing with the electric utilities the responsibility for effecting such savings and whether or not this is according to a general plan.

Merely labeling a goat "war conservation" doesn't make it feel any better—or smell sweeter.

Grand Coulee Pits Adapted to Shasta Turbines

Counter-clockwise units accommodated by puncturing walls of pits designed for clockwise wheels — New method of anchoring scroll cases against flotation

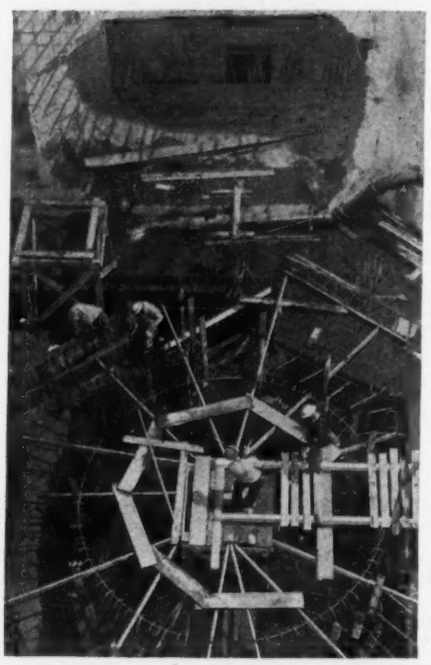
ADDITIONAL POWER for war industries in the Pacific Northwest was recently provided by the Bureau of Reclamation through installing temporarily at the Grand Coulee Dam two 75,000-kw. generating units built for use at the Shasta Dam of the Central Valley project in northern California and completed in advance of the Shasta power plant. Other units will be available at the Shasta Dam by the time it is able to generate power.

The Shasta generators, rated 75,000 kw., are driven by Francis type turbines of 103,000 hp. capacity at 330-ft. head. At Shasta they would operate at a maximum head of 475 ft. At Grand Coulee the head is not likely to fall below 320 ft. within the next few years, because no winter draw-down of the reservoir will be required by this plant until the installation is much further advanced, and the head will not exceed 355 ft.

Pit Walls Punctured

The turbines, built by the Allis-Chalmers Manufacturing Company, are provided with plate steel scroll cases, welded to cast-steel speed rings, made up in eight sections. Bolts on the speed rings and double butt straps on the scroll case unite the sections. The outside diameter of the scroll case is about 42 ft. and the entrance diameter is 12 ft. 8 in. Maximum plate thickness is $2\frac{5}{16}$ in.

The Shasta units are being installed in the left power house at Coulee Dam because the right power house, which is now under construction, will not be provided with heavy cranes this autumn. This has one unfortunate effect in that it requires that three turbine pits, which normally would accommodate 324,000 kw. of generating capacity, be used for the installation of two generators totaling 150,000 kw. capacity, because the Shasta units rotate in a counter-clockwise direction, and the left power house at Coulee Dam was designed for turbines of clockwise rotation. Large openings have been cut in intervening walls and special fittings will convey water from penstock No. 9 to a turbine in pit No. 8, and from penstock No. 8 to a turbine in pit No. 7. Pit No. 9 and penstock No. 7 will be idle for the duration. Units 7, 8 and 9, already ordered for the left power house, will be built left-handed and will be installed in the right power house, which is designed for turbines of left-hand rotation.



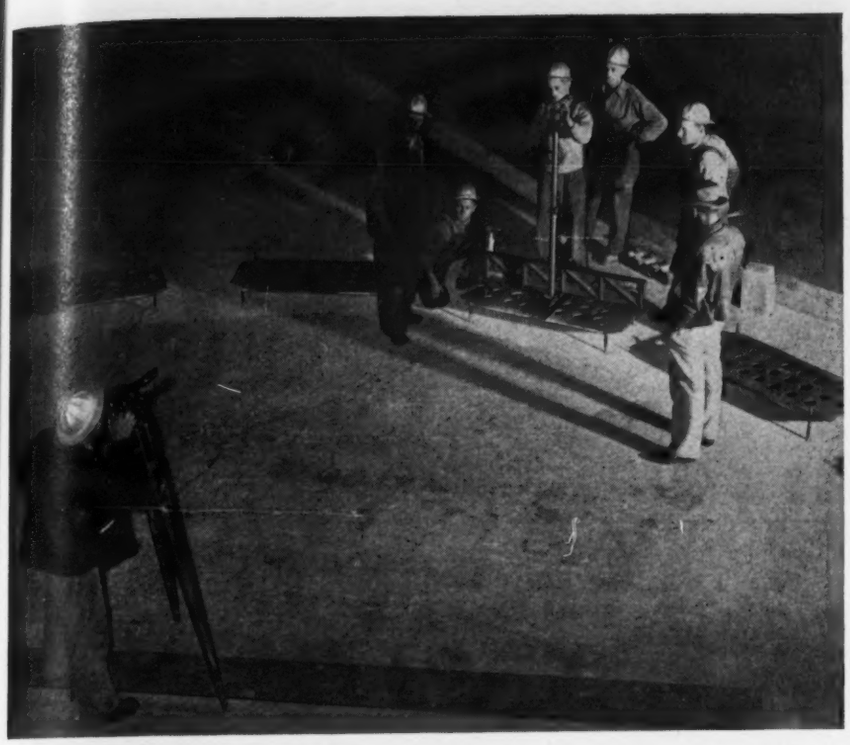
OPENING made in twin walls of reinforced concrete, each 4 ft. thick, to take water from penstock in pit No. 8 for a Shasta turbine in pit No. 7.

Shasta turbines designed for counter-clockwise rotation, whereas the left power house at Grand Coulee was designed for turbines rotating clockwise. Reinforcing steel for draft tube shown in foreground

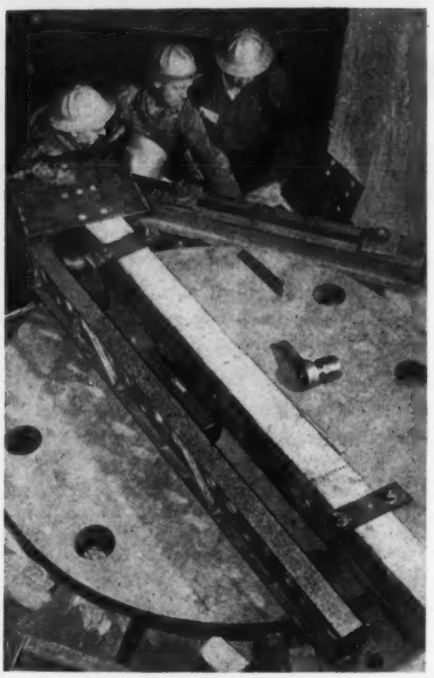
Preparations for the installation of the Shasta units included the cutting out of a small quantity of concrete in pits Nos. 7 and 8 and the making of openings about 23 ft. wide and about 20 ft. high through the 4-ft. twin walls between pits. Diagrams were drawn on the walls to show the locations of steel reinforcing bars, and several rows of holes were driven around the proposed openings, and down the middle of each, with hard-rock drills. Concrete was blasted off of the reinforcing bars, which were burned off to release the concrete in 20-ton blocks, which were removed by the overhead crane and used as riprap.

Scroll Cases Anchored

A modification of the Bureau of Reclamation's former practice is found in the method of anchoring the scroll case against flotation by the concrete in which it is encased. In



METAL PLATE supported on threaded rods adjusted to uniform elevation and leveled. After concrete was placed under them they served as base on which to assemble the stator sections of the alternator



FINISHED CASTING machined to match the flange in the General Electric generator rotor; very carefully leveled, it supports the shaft in an erect position while the rotor parts are assembled upon it

order to avoid the multiplicity of tie rods, which interfere with the placing of reinforcing steel and concrete, the turbine case is supported on steel columns, bolted to the scroll case and resting on screw jacks which, in turn, rest on sole plates set accurately in the pit.

SECTIONS of Shasta turbine being assembled at Grand Coulee

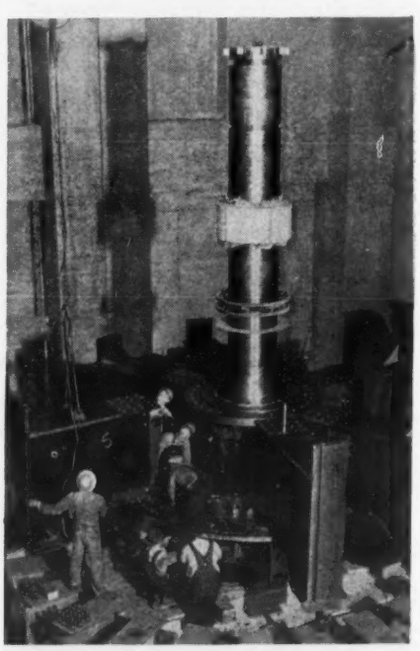
After the scroll case and speed ring are assembled and adjusted to the correct position a concrete saddle is built under each section of the scroll case, with a $1\frac{3}{4}$-in. grouting space between the scroll case and the saddle. Just before the scroll case is embedded the grouting spaces on the saddles are rammed with pre-shrunk mortar.

The purpose of the saddles is to prevent lateral movement of the scroll case when the concrete is placed around it.

Tested for Water-tightness

After being tested for water-tightness, the scroll case is kept under hydraulic pressure equal to the operating head plus an allowance for waterhammer, while being embedded in concrete. The steel columns, with their bases buried in the concrete, take the places of the many tie-rods formerly used.

One stator and one rotor are being assembled on the generator floor of the power house, a stator in pit No. 5 and a rotor in pit No. 9. All parts of the Shasta units will be completed and out of the way by the time the spaces which they now occupy will be needed for the 108,000-kw. units which are to be installed in pits Nos. 4, 5 and 6.



ASSEMBLY of Shasta rotor on plate shown in above illustration

460-Volt Series Lighting Saves Copper

Return to the old incandescent interior lighting circuit suggested to help industrial plants conserve copper and steel — Code interpretation permits 460 volts for industrial plant lighting

GEORGE E. SHOEMAKER, Lighting Service Section, Philadelphia Electric Company

WITH nine out of ten branch circuits in our nation rated at less than 1,800 watts, a No. 14 wire circuit carrying 9,000 watts has news value these days when copper has pushed gold off the front pages. This interesting wiring method applies long-used principles of street lighting to war plant interiors.

The wiring plan is simple. One wire leads from the source of power, perhaps a safety switch, to the first socket and its lamp. From this same socket leads a single wire to the next socket, thus supplying in turn 30 or more lamps. Finally, the wire leads back to the safety switch. In street lighting the switch would be replaced by a constant-current transformer.

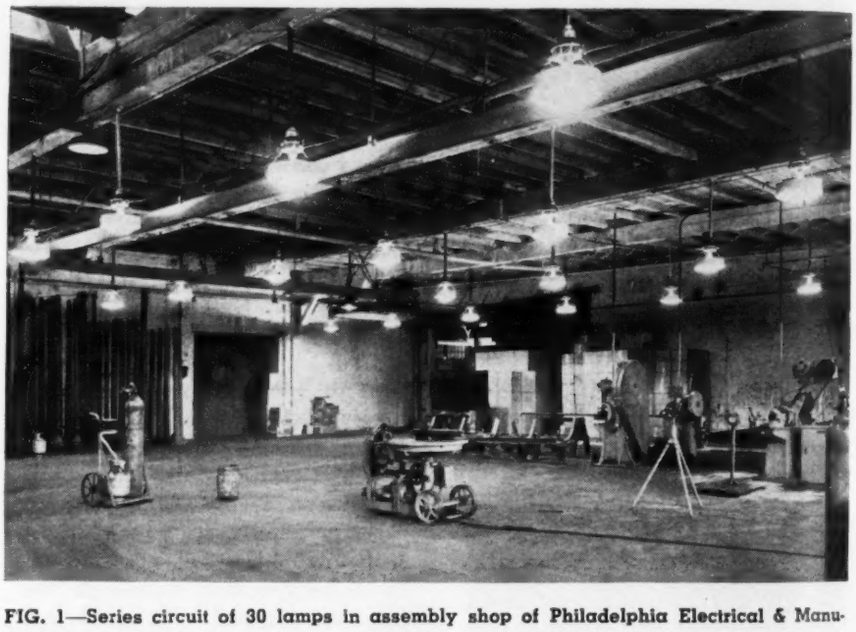


FIG. 1—Series circuit of 30 lamps in assembly shop of Philadelphia Electrical & Manufacturing Company; bare lamps shielded by non-metallic bands, pending arrival of final equipment; stems and wire from scrap

Elements

Elements of the system are:

Power Source—460 volts a.c. (reduced from 2,300 or other primary voltage).

Circuit Type—Series, single wire.

Wire—Usual 600-volt insulation, copper or iron wire, No. 14 or larger.

Socket and Holder—Standard street series porcelain head, with slide-out socket and film cutout.

Control — Two-pole (600-volt) fused safety switch.

Light Source—Standard street series incandescent lamp.

Lamp Rating—6,000-lumen, 20-ampere, PS40 (2,500-hour life, 14.7-volt) or other series lamps.

Assembling these to make up a circuit such as the one shown in Fig. 1, the lamps are on 8x12-ft. centers. Thirty of them mean 250 ft. of wire. Twenty amperes through 250 ft. of No. 14 wire (in free air) result in about 26 volts drop, which subtracted from the original 460 volts leaves 434 volts.

Dividing 434 by the 30 lamps in series, each lamp operates at less than rated voltage by a few percent, increasing its life and reducing its light slightly.

If one lamp burns out the film cutout instantly burns through and short circuits the current, so that the other lamps keep on burning. Now, however, each lamp gets 3 percent more voltage and, instead of burning at less than normal efficiency, swings over to slightly more than normal. The amount of shift is determined by the designer as he decides to use 29, 30 or 31 lamps in series, or picks a lamp of another rating for his circuit.

The burned-out lamp would be replaced by the usual plant procedure. In a large plant group replacement as in street lighting would be used. One or two early burnouts would be replaced, then the circuit let alone for 1,500 burning hours, when all lamps would be replaced.

Savings

The most important saving is in copper. Branch circuits at 460 volts carry half the current of circuits at 230 volts. The same applies to feed-

ers, and circuits can be twice as long for the same percent voltage drop. Two or three hundred feet is all right for branch circuits, where the 115-volt circuit is best kept below 75 ft. Transformers stepping down to 460 volts use less copper than those giving the heavier currents for 230-volt lines.

To be specific, if we provide the same illumination in two duplicate areas, 240x250 ft., one area using the usual 115/230-volt system, the other the suggested 460-volt distribution, we get the following weights of copper wire:

Comparison of Copper Requirements

	115-230 Volt	460 Volt	Saving Weight	Saving Percentage
In branch circuits	162 lb.	62 lb.	100 lb.	62
In feeder	886 lb.	240 lb.	646 lb.	72
Total saving	1,048 lb.	302 lb.	746 lb.	71

There are also savings in panels, safety switches and transformer wiring.

In addition to copper saving, there is a saving in steel. The wiring would usually be open, saving conduit, but if conduit is used the smaller wire often means smaller conduit. Use of smaller panels saves steel. If neck-processed lamps are used (Fig. 2) no reflectors are required. If mirrored glass reflectors are used (Fig. 3) only the holders are of steel.

Since the street series lamp at 20 amp. is more efficient than the usual 115-volt lamp, less total wattage is required for the equivalent light output. An added effect is the excellent maintenance of candlepower of the street lamp. These two features reduce first cost and materials required by 5 to 10 percent, depending on the lamp used.

Maintenance Features

Several items favor the street lamp. Its longer rated life reduces maintenance trouble. Its over-all construction is rugged and heavy. The oversize bulb results in less blackening at the neck. As to the actual bulb replacement, the process is quick. The bulb and socket slide out of the holder at a light pull, either by hand or by a lamp changer pole and grip. The bulb is then changed and a new film cutout is put in (Fig. 4). A push puts the lamp back in service in the circuit, which meanwhile has never ceased operation.

FIG. 2—Series head, Welsbach processed lamp, open wiring

FIG. 3—Series head, mirrored glass industrial reflector, series lamp

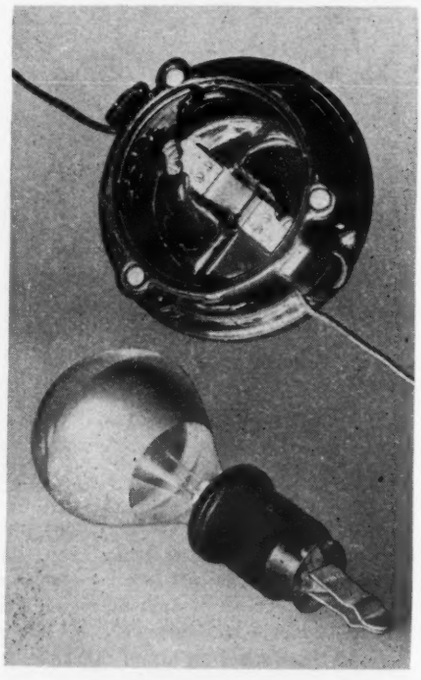


FIG. 4—Standard street series head with socket pulled out, to change lamp and film cutout

Safety

Circuits of 460 volts are being used in increasing numbers. Many contractors and maintenance men have worked with single and polyphase 460-volt lines for years. The new 3-kw. mercury lamp is built for 460-volt operation and the latest four-lamp fluorescent equipment runs on 460-volt, four-wire, three-phase circuits.

The different appearance of the suggested porcelain street-lighting socket of the lamp reminds one that the circuit is not the usual 115-volt circuit. Note also that if you unscrew the burned-out series lamp and screw in a 115-volt lamp the new lamp will not light. Unless the socket is pulled out and a new cutout inserted no new bulb will get current.

With full-page advertisements urging use of 460-volt circuits now appearing in national publications, industrial maintenance men will become increasingly familiar with this copper-saving circuit.

Code Interpretation

The emergency subcommittee of the electrical committee, N.F.P.A., has interpreted the 150-volt-to-ground limitation of Section 2105 of the National Electrical Code as not applying to lighting only in industrial establishments where the fixtures are not less than 8 ft. from the floor and do not have switch control as an integral part of the fixture. Army and Navy authorities consulted indicated much interest in the idea of 460-volt circuits to conserve copper.

Help Needed

There is a growing urgency to arrive at new ways to save critical materials. The series circuit can most quickly be put to use if all who have suggestions or refinements to offer will pool them for the benefit of all. Use then should increase rapidly.

In many of our cities the first interior electric lighting was provided by the series circuits. Sixty years later the series circuit may be on its way back indoors, this time to help win a war.

Two-Man Crews Maintain War Plant Supply Circuits

Indianapolis utility organizes two-man crews to keep war plant supply circuits in top form and to provide speedy emergency service — Crews work largely on own initiative in assigned system areas

W. S. CRONIN,* Indianapolis Power & Light Company, Indianapolis, Ind.

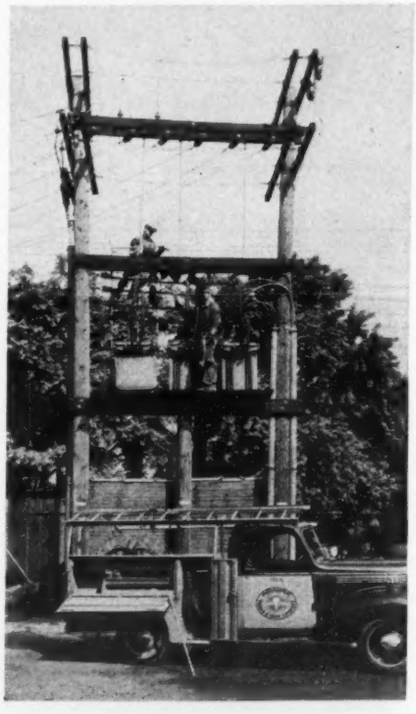
WAR INDUSTRY LOAD is far and away the most important utility load today and continuity to it is therefore highly essential. However vital the problem of maintaining "faultless service" to war industries, it is impractical from an operating standpoint to assign emergency crews to stand by and wait for trouble. However, there is much to justify the assignment of a flexible operating force —such as the five special two-man crews of Indianapolis Power & Light Company—to inspect and maintain war industry and other lines and services. Operation of such preventive maintenance crews not only reduces outages by preventing them but provides a force within easy call to answer trouble calls.

Such an organization has existed in Indianapolis since April, 1942, and its operation to date has exceeded early expectations:

1. Outages on war and essential industries have been held to a minimum.
2. Power service outages have been restored in less time.
3. Vital war materials have been saved by repair.
4. Team work and crew responsibility for better continuity of service has been developed.
5. Second-class linemen have been trained on distribution and transmission operations.
6. Two-man crews now fill the gap between one-man trouble crews and full line gangs on work assignments.

This advance maintenance program sprang from a need for maintenance inspection of distribution circuits and for a manpower reserve to meet emergencies. War industry in Indianapolis has expanded fast. This intensified preparations for handling the growing load.

An immediate objective was to inspect all transformer bank installations supplying war industries, perform necessary maintenance to prevent interruptions and gather load data on vital transformer equipment supplying these industries. Lack of vital priority materials and a general lessening of new construction throughout the system gave further emphasis to the need for a carefully planned preventive maintenance.



TWO-MAN CREW conducts maintenance check-up on transformer bank. Dewey Ray (upper left) checks a fuse after examining cutout connections. Frank Stites is taking current reading with ammeter. He has removed transformer lid for oil check.

Inseparable from these considerations was the indispensability of a reserve of manpower to handle unforeseen emergencies, without holding trouble men in "stand-by" waiting for trouble to occur. Important step in meeting this situation was the installation of a good radio communication system, prior to April, 1942. It released field trouble men for routine assignments while making them available for emergency duty. Most trouble work does not require skilled linemen. Therefore service calls, etc., were assigned to a second- or third-class lineman, freeing experienced men for other work more important to operations.

Since emergency work was a very small percentage of the total, it was considered that the same manpower engaged in preventive maintenance on war plant and other supply circuits could well be used for emergency operations and the two tasks coordinated through radio dispatching.

Five 2-Man Crews

In April, 1942, therefore, a branch of the line department was organized consisting of five two-man crews to perform these joint functions. Each

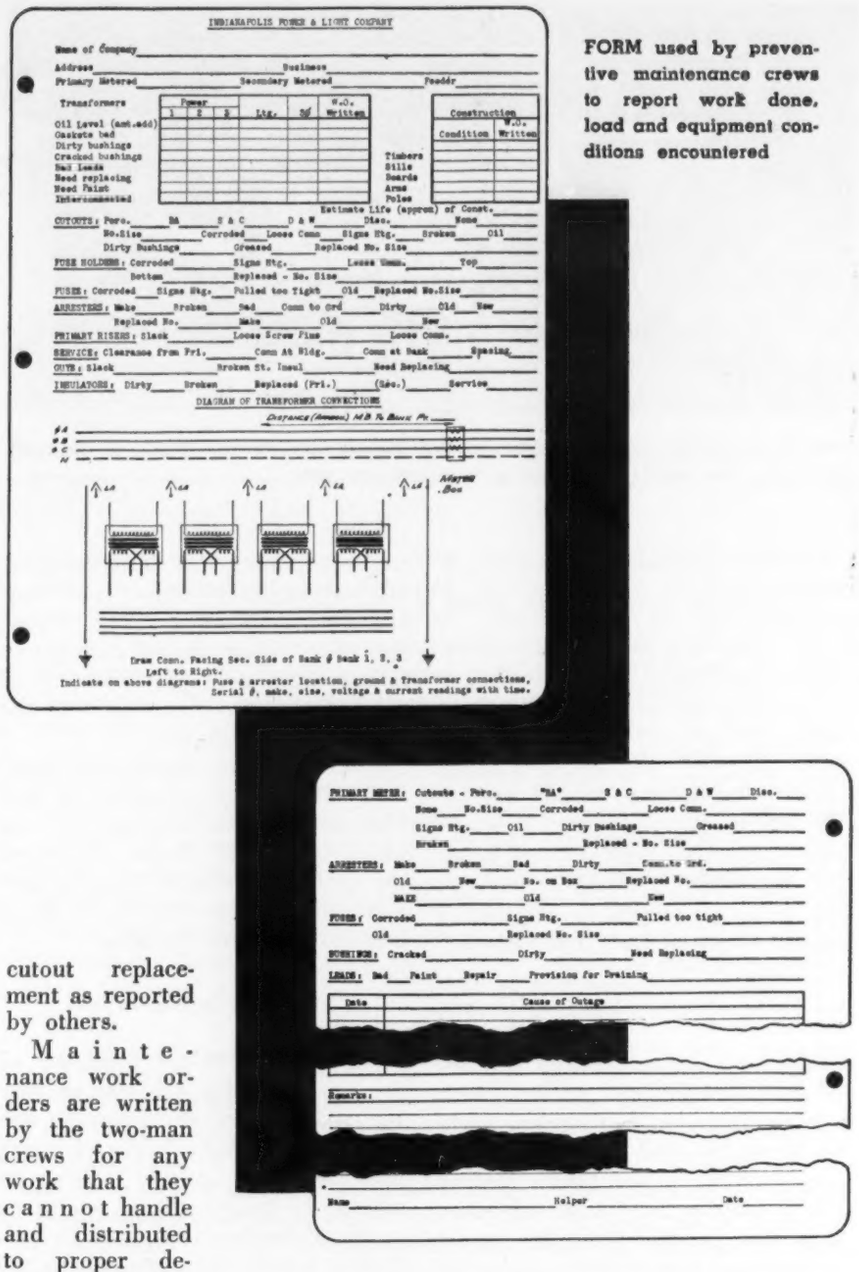
* Superintendent of transmission and distribution.

crew consisted of a working foreman and advanced second-class lineman, operating from a ¾-ton truck that originally carried one man on trouble work. Men selected for two-man crew duties had the following qualifications:

1. Experience in overhead line construction and operation.

2. Inherent capabilities of resourcefulness, initiative and were progressive workmen.

It was possible to divide the system into four districts of about equal size, corresponding to the four main 132-kv. substation areas, for each crew to operate in at all times. This made possible greater flexibility in taking care of power outage calls. Working hours were staggered so that one crew is on stand-by duty to back up the emergency trouble organization at all times between 7 a.m. and 9:30 p.m. six days a week, except Sunday and holidays, when working hours are from 8 a.m. to 4:30 p.m. and 9 a.m. to 5:30 p.m. Since one of the two-man crews alternates on a relief shift, it was possible to use only four trucks for the five crews.


INDIANAPOLIS POWER & LIGHT COMPANY

Name of Company

Address Business

Primary Metered Secondary Metered Feeder

Transformers — Power 1 2 3 Ltg. 3ø — W.O. Written

Oil Level (ast.add)
Gaskets bad
Dirty bushings
Cracked bushings
Rad Leads
Head replacing
Need Paint
Interconnected

Construction — Condition — W.O. Written

Timbers
Sills
Boards
Arms
Poles

Estimate Life (approx) of Const.

CUTOUTS: Poro. BA S & C D & W Disc. None

No.Size Corroded Loose Conn Signs Rtg. Broken Oil

Dirty Bushings Greased Replaced No. Size

FUSE HOLDERS: Corroded Signs Rtg. Loose Conn. Top

Bottom Replaced - No. Size

FUSES: Corroded Signs Rtg. Pulled too Tight Old Replaced No.Size

ARRESTERS: Make Broken Bad Conn to Grd Dirty Old New

Replaced No. Make Old New

PRIMARY RISERS: Slack Loose Screw Plug Loose Conn.

SERVICE: Clearance from Pri. Conn At Bldg. Conn at Bank Spacing

GUYS: Slack Broken St. Insul Need Replacing

INSULATORS: Dirty Broken Replaced (Pri.) (Sec.) Service

DIAGRAM OF TRANSFORMER CONNECTIONS

Distance (Approx) M.B. To Bank Pr.

A
B
C
N

Alarm Box

Iron Conn. Facing Sec. Side of Bank ø Bank 1, 2, 3
Left to Right.

Indicate on above diagrams: Fuse & arrester location, ground & transformer connections, Serial ø, make, size, voltage & current readings with time.

PRIMARY METER: Cutouts - Poro. "BA" S & C D & W Disc.

None No.Size Corroded Loose Conn.

Signs Rtg. Oil Dirty Bushings Greased

Broken Replaced - No. Size

ARRESTERS: Make Broken Bad Dirty Conn.to Grd.

Old New No. on Box Replaced No.

MAKE Old New

FUSES: Corroded Signs Rtg. Pulled too tight

Old Replaced No. Size

BUSHINGS: Cracked Dirty Need Replacing

LEADS: Bad Paint Repair Provision for Draining

Date	Cause of Outage

Remarks:

Name Helper Date

FORM used by preventive maintenance crews to report work done, load and equipment conditions encountered

Assignments

Transformers and defense substation installation receive their special attention first. Remainder of their time is spent in scheduled preventive maintenance and inspection on distribution circuits in territory assigned by the line department supervisor. Crew locations are made known at all times to the service dispatcher and controlled to the extent that not all crews are in extreme outlying districts at the same time. They are strategically located for emergency assignments in event of power outage calls or for distribution and transmission switching operations. Crews are furnished copies of all operating reports as a guide to probable causes of outage and to measure the effectiveness of their efforts to reduce outages.

Supervision of the crews remains with the line department. They are, however, free to requisition the services of a distribution engineer upon request on jobs where his services are required. Otherwise, to a large extent this group of men are "on their own." Their work orders consist only of incidental maintenance orders, such as a lightning arrester, crossarm and cutout replacement as reported by others.

Maintenance work orders are written by the two-man crews for any work that they cannot handle and distributed to proper department for further checking or execution, with the distribution operating engineer following up referred work orders through other departments to assure execution and avoid discouragement of the crew's initiative.

Typical Instructions

Typical of the detailed instruction to crews regarding maintenance of system elements is that pertaining to power bank maintenance of special war industries, which is their first responsibility. Similar instructions are issued for other system elements, poles, guys, etc.

Power bank maintenance—special industries:

(a) Replace all fuse links.

(b) Replace all old arresters with new arresters.

1. Old arresters are as follows: Any G. E., W. H. and C. V. arresters that do not have connectors for ground wire connections.

2. L. M. arresters that do not have isolator.

(c) Use ammeter for making indicating current tests, make measurements of transformer current on secondary side of transformer and state time test is made.

(d) If bank is in such condition as to warrant immediate replacement, make only necessary repairs that would prevent a dangerous condition. Examples:

1. Pole broken off—tie up if necessary.

2. Cutout broken—replace.

(e) Clean all transformer bushings and check to see if leads are syphoning oil or water.

(f) Clean clips in cutouts and replace, if necessary.

(g) If connections in cutouts are soldered—replace cutouts or clips.

TWO-MAN CREWS working on preventive maintenance operate from ¾ ton truck with radio and complete tool supply for emergency work

(h) Clean fuseholders and replace, if necessary.

(i) Check oil level and add needed amount.

(j) Replace any bad gaskets in transformer lids and, if loose, reglue.

(k) Check all connections.

(l) For further maintenance, see form provided and fill in same very carefully.

(m) Also bring into the office any bad equipment that can show the bad operating condition that did exist on banks you are overhauling.

(n) Report primary meter box condition, paint requirements, repairs visibily necessary and interior visual examination for line defects. Check to see if leads in drip loop to meter box have been opened or soldered to prevent leads from syphoning water.

(o) Service—check connection at bank and outlet, clearance from primary and spacing.

The form shown herewith was developed to report crew activities with a minimum amount of clerical work. On it are reported maintenance and inspection of power banks feeding war industries for future reference. It is also possible from this report to check for proper fusing, lightning arrester protection, load on the bank, conditions of bank construction, etc. This record is used to establish how often or how soon this bank must be inspected to keep it in good operating condition.

Results Gratifying

Maintenance work for the feeders is recorded on section maps covering one-half of a square mile of area. Maps show all poles, secondary line, primary lines, transformers, services, etc. The crew is also given a feeder map of the primary circuit plus the number of section maps that cover the areas of the distribution feeder.

Results obtained from this two-man crew operation to date have exceeded original expectations in improving distribution operations. The current operating report shows that power failures have been practically eliminated due to the effectiveness of the maintenance program.

Instances of overload transformer bank were found, along with bad fuse connections, improper fusing, which to a large degree vindicated the apprehension of our system performance with the rapidly changing load conditions in this area.

Flexibility of Operation

An example of the flexibility of the crew operation occurred on May 18, 1942, when a very important war industry reported "wires burning near meter box on pole." Being an emergency assignment, it was given to one of the two-man crews then on routine maintenance. Answering the call, the crew found a connection nearly burned through at the point of failure due to extremely heavy load. The fault was corrected without outage within 17 minutes.

Men participating in the crew operation have accepted the opportunity with enthusiasm, primarily for the reason that they are given an opportunity to use their own initiative. One of the working foremen summed up their attitude in this manner:

"The job is fascinating because we are permitted to use our own initiative and judgment. Responsibility is felt for preventing power failures as they reflect how well we are doing our job. Also, the patriotic incentive is with us to keep war industries going, believing our efforts are a help toward winning the war."

•

Women Work in British Utility Plant

Women are being employed extensively in the Fulham utility, according to W. C. Parker, the borough electrical engineer, in a recent issue of the *Electrical Review*, London. All meter readers have been women since June, 1941. They do power plant greasing and act as painters' assistants. They repair, test, calibrate meters under the supervision of a man. Half the staff now repairing faults on consumers' premises, including appliance maintenance, are now women and they will increase to 75 percent.

Women operate the 120-ton overhead traveling crane in the power house and the small mobile cranes as well; they are engaged on the conveyors for coal handling and boat unloading. Auxiliary pumps, ejectors, evaporators and deaerators are operated by women. They are being trained to take over the tasks of electrical and mechanical fitters for whom they now do preparatory operations.

Lathe work, turning, boring, grinding and welding, is done by female operators. Others are being trained to test and calibrate such station instruments as multi-point temperature indicators, CO_2 recorders and steam-flow meters.

Clerical Staff

About 72 percent of the total clerical staff are now women; one 24 years of age heads the purchasing department and a 19-year-old assistant acts as internal progress clerk, occasionally visiting manufacturing plants to inspect and check progress. Including coal, the value of the goods purchased exceeds a million pounds. A permanent shorthand-typist has been placed in charge of the consumers' service department, controlling a staff of ten, nine of whom are women. All the staff, including the head, of the payroll department are women. Women are also serving as storekeepers.

War Demands Re-emphasize Power Supply Fundamentals

Diversity as an element of reserve, economy of the highest practicable voltage, rkva. generation at points of requirement and effects of overloads are basic considerations that must not be overlooked

*D. M. JONES, Manager Central Station Engineering Department, General Electric Company**

THE FACT that the basic requirements of the electrical industry, that it provide power with acceptable characteristics when and where needed, are the same in peace and war makes it doubly sure that sound engineering will provide the proper guide in the days directly before us. Therefore, the power system that was well organized, well designed and well operated under peace conditions will be in good basic shape to meet the needs of war. The power system admittedly, however, will have to be more than normally careful with what it has, because of the difficulty of getting more; thus it will be largely reduced to living on its hump, as it were, though at the same time it will have to produce all the power needed, and as economically as possible. Thus, in the days to come this industry will be increasingly thankful for its hump.

This basic adequacy of the peacetime power system design for conditions of war has not always existed. In fact, it did not develop until power systems reached that degree of maturity where "reliability through diversity" logically displaced the older concept of "reliability through the absolute invincibility" of power plants and major substations, for it is this diversity approach which now proves to be the fundamental defense for power systems against the ravages of war, whether by bombing, bombardment or sabotage.

Through this design approach not only are the power systems able better to conserve their equipment, under the fury of attack, and even their personnel, because people as well as equipment can be distributed, but also they can weather the loss of major system elements without interrupting service and thus better can sustain the continued productivity of vital industries. This permissible temporary outage of major elements of the power system, in addition, permits changing the design approach on them from complexity to rugged simplicity, with a resultant reduction in time, space, labor and materials, which reaches a maximum with the full utilization of quantity production equipment. Such savings are particularly welcome under present conditions.

* From paper to Engineering and Operations Section, Southeastern Electric Exchange.

Highest Practicable Voltage

There is another fundamental of power system design which also serves valiantly in peace and in war, and yet in some of the areas where minor power supply systems to supply war requirements recently have popped up, like daisies, considerable vital material has been wasted through its neglect. This is the fundamental concept that electrical energy should be transmitted at the highest feasible voltage.

Power systems in their evolutionary development have followed a step-by-step growth, where each stage was characterized by a change to a higher voltage for its major transmission. Where this advance has been well timed and properly executed, as on well-designed power systems, the power flow from source to utilization point tends to be at a major voltage for the greater part of the distance. Whenever this principle is followed basic reserve transmission capacity becomes available without excessive loss, or undue use of copper. In distinction, a power system which has lagged behind its basic requirements in this respect, and thus has been attempting to handle what was rightly a major transmission requirement at minor transmission voltage levels, will not be able to show this inherent transmission reserve capacity, due to the rapid rise of its incremental load loss, despite the large amount of transmission copper already necessarily present.

Down to Fundamentals

The fundamentals of this situation are simple and yet they are so important that it seems permissible to review them briefly:

In transmitting a given amount of electric power a given distance, plainly the voltage or the amount of copper, or both, can be varied, with accompanying changes in current density in the conductors and therefore in transmission losses. Assuming unity power factor throughout in the interest of simplicity, the following statements and data have an accuracy well within the requirements of these general comments:

If the transmission loss is held constant the copper requirements will vary inversely with the square of the transmission voltage, and, conversely, if the copper requirement is held constant the transmission losses will vary inversely with the square of the transmission voltage.

As the first assumption leads to excessive copper requirements and the second to extreme losses at the lower voltages, some compromise between these extremes is generally fol-

lowed. A convenient intermediate assumption from an analysis standpoint and one not too far from usage is that of keeping the current density in the conductor constant. On this basis the copper requirements and the losses both increase inversely with the voltage instead of with its square.

It reasonably may be said of any power system that, on the basis of constant current density which is within the range of practice, one ton of copper per mile and 6 kw. of losses per mile will be saved for every 1,000 kw. which is transmitted at 138 kv. instead of 13.8 kv., or proportional results for other voltage increases.

Effectiveness of transmitting power at adequate voltages in reducing system losses and copper requirements is therefore plainly enormous and beyond argument represents one of the most potent ways of conserving vital materials in the electrical industry in our present emergency.

It will be of further interest to realize that the full execution of this concept of carrying the power all the way at adequate voltages results directly in smaller stepdown substations located closer to the loads, which dovetails in perfectly with the diversity concept discussed above and thus makes available not only the advantages and savings incident to the use of adequate transmission voltages but also those previously outlined as resulting from the acceptance of the diversity approach to power system design.

Kilowatt Transmission

Let us now transfer our attention from the field of the fundamentals of power system design to certain concepts with respect to generation which bear on conservation under our present conditions, and direct our attention to the simple consideration that any power system can reduce the burden on its transmission facilities by deciding to deliver, as far as possible, kilowatts only all the way from the power plant to the load. This, of course, can be practically accomplished by generating the load excitation kva. requirements adjacent to the locations where they originate. This would plainly go a long way toward clearing the rkva. flow from the major part of the system and make way for more kilowatts.

The comprehensive advantages of producing the load rkva. from its own generating sources adjacent to where it is needed are emphasized by the following considerations. Power generating plants cost $125 per kw. more or less for steam units, and up to $350 per kw. for hydro type, while rkva. generating equipment costs $10 an rkva. or less, and the rkva. generating plant can be located so as to place very little transmission burden on the over-all power system. Thus it can be seen that the production of rkva. by separate generators at proper locations, in general, can be amply justified, either by the release of transmission capacity or of power generating capacity. These joint facts indicate how great are the possibilities of this procedure.

Responsibility for Rkva.

In considering the generation of rkva. elsewhere than at power plants, it may be worth while to suggest that the power company normally should be able to provide for the separate generation of rkva. at a lower cost than a customer, for the power company has a more stable business than the average industrial customer and therefore can afford to write off this investment more slowly. In addition, if the power company owns the rkva. generation, it has a much better control over the design and operation of its system than if the amount and location of the rkva. generation is beyond its control.

These conclusions may not seem entirely justified to some, on the basis that the power company apparently has a reasonable control, at least over the *amount* of customer-installed rkva. generation through its control of the power rates which determine the earnings of such installations. In reality, however, the power company at best is in the position of *one* boy trying to keep a pig in a pen with *two* holes in the fence. The power company sets the rates, admittedly, but the earnings to the customer on his rkva. generating equipment depends not only upon those rates but also upon what he has to pay for the equipment, and the market price on such equipment, in terms of capacitors at least, has been going down steadily with the years. Therefore, the power company with no change in rates can look forward to an ever-increasing loading of its system with customer-owned, random-located and improperly controlled rkva. generation, if the present long-time dropping price trend in the capacitor market is maintained.

Permissible Overloading

Fundamental limitations of exact knowledge concerning the life of electric insulation assemblies with time and temperature are not due to lack of interest or an unwillingness to spend reasonable amounts of time and money on this question. The difficulty lies in the make-up of the problem itself.

In any piece of electrical equipment there are almost an infinite number of possible paths of electrical breakdown over the insulation assemblies incorporated in the device, and the continued availability of that device requires a sufficient resistance in each of these paths at all times when in service to prevent electrical failure, and, conversely, only one path has to fail to put the whole equipment out of service.

For example, the time required for an insulation of any given brittleness to break physically plainly depends jointly upon the magnitude, frequency and nature of the forces tending to produce movement in that insulation and the amount of physical support provided the insulation against those forces. Likewise, there is no telling whether a particular physical break will be the one which will produce electrical failure. We have all seen major insulation breaks which did not cause electrical failure and minor ones which did.

In addition, all the data from tests and studies of insulation performance necessarily have been taken on a short time basis and it is only by extrapolation that over-all concepts have been developed, although checked to some degree, of course, by the loose generalizations of operating experience.

Therefore, the greatest service that we can now render in connection with this approach, particularly under present conditions, is to continue our activity in this field of insulation study, whether it be in developing new information or applying that which already exists, on that sound engineering basis which broadly characterizes all activity in the electrical industry.

Will Bi-Monthly Billing Help the Utility Manpower Problem

A report on Detroit Edison Company's experience of 25 years with bi-monthly meter reading and billing of residence customers — A discussion of problems to be considered and savings to be realized by a change in meter reading and billing

DAVID ROBERTSON, Detroit Edison Company, Detroit, Mich.*

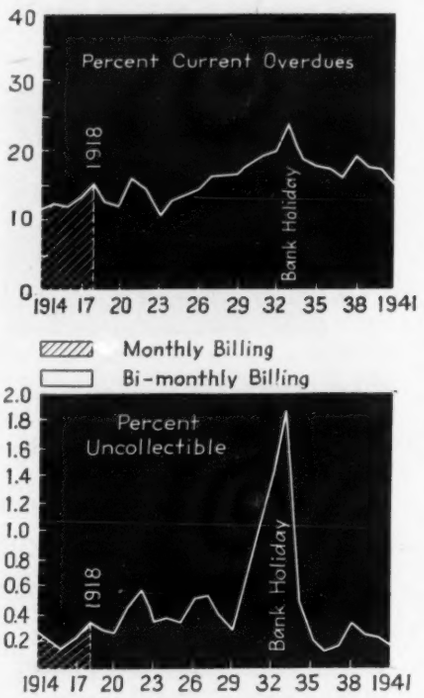
FOR THE PAST 25 years the Detroit Edison Company has been reading residential meters and billing on a bi-monthly basis. With a quarter of a century of experience with this method of billing behind it the company feels that the change made in the spring of 1917 was completely justified. There have been no detrimental effects on customer relations; estimated savings of 260 full-time employees and $582,000 in operating expenses yearly are estimated to have resulted.

Problems

The change from monthly meter reading and billing was made during the last World War, when the company's personnel was reduced by the loss of 745 employees, or 24 percent of the organization. These employees could not be fully replaced and, in addition, operating expenses for both labor and supplies increased drastically.

Measures had to be taken to effect economies both to use available manpower to the best advantage and hold operating expenses within reasonable limits.

When bi-monthly meter reading and billing was adopted the company had 188,553 customers on the lines. Today there are 765,997 customers, of which 684,995, or 90 percent, are residential customers billed bi-monthly. The other 81,002, or 11 percent, are commercial, industrial and steam customers who are billed monthly.



OVERDUE BILLS and uncollectible accounts reflect business conditions, but show no increase under bi-monthly meter reading and billing

In considering the change a number of important problems, several of which appeared to be obstacles, confronted the company:

1. *Would additional working capital be required because of the change and because of the additional month of earnings from residential customers that would be outstanding thereafter?*

It was necessary to increase working capital, as 50 percent of the revenue from residence accounts was collected a month later. At present the company estimates one month's residence revenue as accrued earnings. Annual residential revenue is now about $25,300,000, or approximately $2,100,000 a month. Half of this now is outstanding each month.

2. *Should deposit requirements be increased to protect the company for the additional month's revenue outstanding?*

When the change was made 15.4 percent of the accounts were secured either by cash deposit or by guarantors. The guarantee method has since been discontinued entirely and only 4.8 percent of accounts are secured by cash deposits. The large decrease in the number of deposits is another story, but it does prove that bi-monthly billing is no obstacle from the standpoint of security. Uncollectible losses are a better proof and will be discussed later.

3. *Would there be more resistance to load-building efforts by customers or any tendency to decrease the use of service due to the larger bills?*

The average annual use by resi-

* Assistant Supervisor, Collection Bureau. Based on paper presented by author before the Public Utilities Group of the 47th Annual Credit Congress of National Association of Credit Men.

dence customers in 1917 was 333 kw.-hr. This has increased steadily to 1,150 in 1941, as shown in the accompanying chart. This is 16 percent higher than the national average.

4. *Could, or would customers pay promptly? Would write-offs (uncollectibles) increase?*

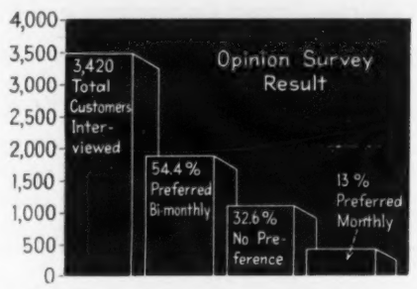
The change apparently has had no detrimental effect either on the promptness of payments or on uncollectibles. As is shown in the graph of uncollectible bills, the peaks and valleys appear to follow the general business trends. At present the uncollectible write-off is only 0.16 percent.

5. *How would customers like the change? Would more high bill complaints be received? Would customers overlook the fact that the bill covered a two-month period?*

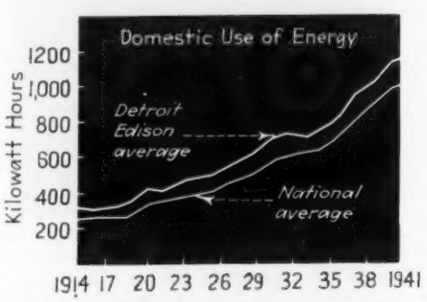
The possible effect on customer relations was the consideration that was most carefully weighed by the company. A close watch has been kept for the answers ever since the program was started. Comparatively few complaints have been received that could be traced directly to bi-monthly billing. In 1937 a survey was conducted, directly questioning 3,420 customers who called at business offices, regarding their preference of billing periods. Of these 54.4 percent preferred bi-monthly billing, 32.6 percent had no preference and 13 percent preferred monthly billing. Practically all customers in the latter class were making payments on delinquent accounts.

Customer reaction bears some relation to the fact that 29 percent of all residence customers pay a bill of less than $4.23, 52 percent less than $5.45, 80 percent less than $7.70 and, finally, 97 percent less than $13.32 for two months service. This indicates that residence customer bills have not reached the point where it would be a burden to pay because of bi-monthly billing.

We have been asked repeatedly by other utilities what reaction might be expected of customers if the bi-monthly system of meter reading and billing were instituted today. It is believed that customers today would not only be as receptive to the plan as they were in 1917 but more so, particularly if companies considering the move did not hesitate to advertise the fact that they were making the change to help not only themselves but also to save manpower for the war effort. Today people are receptive to changes, and it seems probable that the reaction of the customers would be excellent at this time. In England today quarterly billing is almost universal, and in a great many cases it has been the result of a shortage in manpower. The longer that our nation is at war, the greater is the possibility that conservation will be even more essential. Other companies may be forced to go to bi-monthly or quarterly billing.



OPINION SURVEY by Detroit Edison shows that only 13 percent of customers interviewed preferred to be billed monthly



NORMAL INCREASE in domestic use of energy during 25 years under bi-monthly billing reveals that it is no hindrance to load building

Bi-monthly vs. Monthly Billing

It is interesting to compare the effect of bi-monthly with monthly billing on the various groups within an organization that are directly concerned with billing and meter reading:

Meter Reading and Bill Distribution Groups—This group's main functions are the actual reading of meters and distribution of bills. If a change was made back to monthly reading and billing the percent increase for the different operations and expenses would be as follows:

Expense:	Labor	65%
	Supplies	46%
	Total operating	60%
No. of employees		71.8%
Automobile mileage		60%

Billing and Records Group—This group is concerned with rendering bills and accounting for payments. A change to monthly billing would increase expenses as follows:

Expense:	Labor	26%
	Supplies	32%
	Total operating	27.5%
No. of employees		33.6%

Collection Group—This group is concerned with collection of overdue accounts and activities of the company's 906 collection agencies, composed of banks, drug stores, groceries, etc.

In regard to partial payments, the company did not have any general routine for partial payments under monthly meter reading, or for twelve years after bi-monthly billing was adopted. However, the company did begin to take partial payments in 1930, and in 1939 accepted as many as 48,000 per month. Their present average is about 14,000 per month. This, we believe, is due to the habit of paying bills in installments, formed during the depression years, coupled with our lenient collection policy, and not to bi-monthly billing.

It is doubtful if customer relations would be improved by a change to monthly billing. The company's policy on overdue accounts is based on the amount owing, past record, length of service, and individual circumstances. There would be no change in collection practice or in the frequency of collector's calls, but there would be an increase in the volume of clerical detail work. The collection group would be affected as follows:

Expense:	Labor and supplies	43.5%
	Total operating	38%
No. of employees		32%

Cash Department Group—Function of this group in connection with bill payments is the handling of all bills paid by mail and through agencies and the recording of all moneys deposited in banks by various groups. If a change was made to monthly billing the group would be affected as indicated:

Expense:	Labor and supplies	49%
	Total operating	47%
No. of employees		59%

Summarizing the over-all effect if the Detroit Edison Company were to return to monthly billing and meter reading, it is estimated that the percentage of increase necessary in man-hours, automobile driving and expense of the groups concerned with billing and bill payments would be:

Total expense: Labor	36.6%
Supplies	30%
Total operating	35.7%
Total Number of employees (clerks, meter readers and bill distributors)	32.5%
Total automobile mileage	48.7%

It should be kept in mind that figures given here as an increase represent a possible saving to companies wishing to change to bi-monthly meter reading and billing.

Other Plans

Within recent years the Detroit Edison Company has studied three other plans of meter reading and billing:

1. Read meters bi-monthly and bill monthly. Under this plan the company would estimate the meter reading every other month.

2. Both read and bill bi-monthly, each bill issued to have two parts, thereby giving the customer the privilege of paying half of his bill each month.

3. Read quarterly and bill monthly. Two monthly estimated bills would be followed by a corrected bill based on actual meter reading every third month.

All of the three plans would show a slight saving over monthly reading and billing, but nothing to compare with the saving under the method of straight bi-monthly meter reading and billing. In addition to this, estimated or corrected bills are always confusing to customers, and this is no asset to good customer relations.

After 25 years experience under bi-monthly meter reading and billing it is the Detroit Edison Company's intention to continue this practice unless it is forced to change to some other method through circumstances beyond its control.

The present method of billing has had no detrimental effect on customer relations. The saving of 260 full-time employees is very important at this time and the saving of $582,000 yearly has been a contributing factor in the continuously downward trend of Detroit Edison's rates.

Service Is Keynote of Wartime Power Sales

Omaha power sales engineers organize under wartime program to render all-out consulting service to eighty local war industries — Help non-war industries to get by with existing services

VARIOUS, elaborate and diversified as are the plans advanced by various agencies to help the nation's industrial plants engaged in war production today, few are more carefully conceived or as well integrated in terms of the present need as the service program under which the Nebraska Power Company's power salesmen have operated for the past six months in and around Omaha.

Nine objectives, founded on service and executed in a spirit of co-operation and understanding, underlie the plan. Objectives of the program are to:

1. Help win the war.
2. Contribute to conversion of industries from civilian to war production.
3. Help industrial management make better use of its existing services.
4. Guide the maintenance and care of existing equipment.
5. Aid in restoring equipment to service.
6. Establish an equipment exchange so that one customer needing equipment may get it from another who has machines he wishes to sell.
7. Promote additional services only in industries working on war contracts and whose production can be bolstered by additional service.
8. Build better understanding of utility service.
9. Create a better understanding of rates and service bills.

Industries Grouped

To direct effort where needed, industrial customers in Omaha and Council Bluffs have been divided under the program into two groups: (1) All industries (about 80) actively engaged in war work plus several army posts and (2) industrial, governmental and municipal customers, in general, having no direct war work.

Because needs of war production industries are considerably different than the general run of industrial customers, objectives and methods of obtaining these objectives are different for these two groups.

War Industries

Principal aim of the power sales program is to give every possible help to local war industries so that they may do a better job; to show these industries how to use electricity to increase production, cut waste and improve quality of work, save time and eyesight, and how to apply production aids such as infra-red drying, modern drives and automatic control.

The utility power sales engineer is in an unusually fine position to guide industry along these lines, for few people have the knowledge he possesses of industrial plants and personnel, their operation and their history.

Power sales engineers in Omaha are using this knowledge in the following ways for the assistance of local war industries:

1. Obtain needed equipment; they check lists for used equipment available for specific applications.
2. Advise customers on priority requirements.
3. Consult on best types of drive and control.
4. Guide use of existing equipment and suggest modernization of equipment that has been discarded; suggest improvement of drives and plant layout.
5. Propose modernized production methods, help to streamline production.

EDUCATION MEETINGS for war plant executives and men pass along "know how" on care and use of electrical aids to production. Above and below are pictures of lighting and welding conferences

6. Assist in subcontracting by maintaining contact with the Industrial War Production Board and the local industrial pool.

7. Help to increase plant efficiency through better lighting, ventilation, water cooling, dust collecting, etc.

(A complete program for bringing the value of good lighting to the attention of all War Production customers is being carried out. Surveys and recommendations have been made in many plants, resulting in a number of new installations and many changes in existing installations.)

8. Discuss the problem of food service facilities; check adequacy of lunchrooms and equipment and assist where expansion is being considered.

9. Furnish suggestions for improved maintenance of fixtures and equipment.

10. Test motors for loading and make demand checks.

11. Help save time through better control and handling of material.

12. Help prevent sabotage through recommendations on protective lighting, fencing, use of guard systems and searchlights.

13. Discuss problems of line extension and financing so that changes can be included in the customer's estimate of production costs.

14. Help eliminate delays caused by outages due to inadequate wiring and fusing.

15. Increase floor space by guiding rearrangement of equipment.

16. Suggest use of unskilled labor on definite schedule to keep the floors, lighting fixtures, equipment and materials clean.

17. Recommend cheerful and bright surroundings in working areas. Proper use of paint will greatly improve working conditions.

18. Improve load conditions through use of capacitors and by load integration.

19. Distribute safety information. Help reduce lost-time accidents.

20. Reduce power losses by correct application of motors and equipment.

21. Recommend equipment such as infrared that will reduce processing time.

Supporting Material

To equip individual power salesmen to render these electrical services under the program each is provided with two manuals—one on lighting and the other on power sales.

The *lighting handbook* includes complete information on industrial plant and office lighting, protective lighting and special lighting applications.

Included are:

"How Light Can Help," by Freeman Barnes.

"Good Lighting will Help Us to Win"—*Factory Management and Maintenance.*

"Lighting and Production."

Photographs of actual installations in Omaha.

"American Recommended Practice of Industrial Lighting"—I.E.S.

Lighting Design Data—General Electric Company.

Complete Lamp Data.

Equipment Catalogues.

Protective Lighting Design and Equipment.

"Three-Dimensional Seeing"—Du Pont De Nemours & Co.

This manual gives power salesman all the data generally needed for lighting work and includes the advantages of good lighting, proper design and equipment available. It can be used as a visualizer in discussing improved lighting with industrial management.

The *power manual* includes information on services and equipment other than lighting, such as motors and their applications, heating and ventilating, drying, refrigeration and cooking. Salesmen also carry complete information and charts on the company, and its operations, recently compiled.

Non-War Production Plants

While the bulk of the company's wartime industrial sales effort is directed toward helping war plants in the territory, non-war production plants are being contacted and every service rendered that is consistent with the altered conditions now existing everywhere. Discontinued promotion of additional services to non-war production plants is a realistic necessity consistent with altered conditions familiar to every one. It is the objective of the power sales program, however, to contact these cus-

tomers regularly and to render them every service consistent with the times.

Every effort is made to keep them informed of new types of equipment and services so that when materials are again available improvements in plant can be made. Service calls are made to keep the company's relations on the highest plane and to assure these general customers of the company's interest in them and their problems. Above all, however, the object of the program is to help the management of non-war production plants to contribute their part in winning the war; for when the war is over every one will be judged by what he did when the going was tough.

Service Contact Calls

The type of help that is being extended these customers through the medium of service contact calls is outlined below:

1. Analysis of the customer's plant and equipment for possible subcontracting work. Helping him get in touch with the WPB and giving advice on subcontracting questions.
2. Furnishing information and advice on maintenance of equipment and its importance in increasing efficiency, decreasing maintenance costs and prolonging life of equipment. Showing the customer how to clean lighting fixtures to improve lighting intensity.
3. Guiding the restoration of damaged equipment to service. Giving assistance on minor repairs or directing the customer to agencies equipped to handle machine repair.
4. Listing electrical and mechanical equipment the customer no longer uses. This supplements the "used equipment" file kept by the company and made available to those who need such apparatus.
5. Render service whenever possible.
6. Discussing the part Nebraska Power Company is playing in the war program—provision of service for war industries, policies regarding line extensions and financing, number of employees in the armed forces, co-operation in civilian defense etc.
7. Presenting advantages of purchased service particularly applying to the customer.
8. Keeping alive the customer desire for a particular service, appliance or piece of equipment, which the customer needs but cannot get; keeping record of these for future prospect list.
9. Analyze customer's bill when in order and discuss rates.
10. Consider all complaints carefully and follow through on them until settled.
11. Assist in load molding by suggesting control of peak demands, longer hours use and installation of capacitors.
12. Keeping alive the necessity of conserving material and equipment.
13. Suggesting protective lighting when in order.
14. Correcting unfavorable attitudes toward the company.

An important and highly successful outgrowth of these efforts on the part of the Omaha utility to help local industries participating in the war effort has been a series of educational meetings for maintenance men, mechanics, welders, foremen and executives of Omaha plants, to discuss problems relating to electrical aids to industrial production.

Meetings Prove Helpful

These meetings bring together technicians with a common bond of interest, a fact that contributes to lively discussion and mutual helpfulness. Out of these gatherings has grown requests for service, surveys and consulation which the company's service program originally envisioned, but which were not always easy to stimulate by direct customer calls, especially in wartime with its attendant shifts in industrial personnel and travel restrictions.

Actual men-on-the-job made up a large percentage of the attendance at the welding meeting. From these experienced men came such remarks as: "I have welded a long time, but I never knew before how to finish my bead without a crater," or "I got a real pointer there on how to avoid arc blow," etc.

Forty-two men representing sixteen Omaha industrial plants attended a lecture demonstration on industrial lighting. Company lighting engineers discussed the use of existing equipment to correct lighting deficiencies through relocation of units and selection of proper types and sizes of lamps for specific lighting needs. Other lecturers emphasized the shift in employee age in war plants to higher brackets and the urgent need to help older eyes overcome their natural handicap, through brightness control, glare elimination and lighting for comfort and efficiency.

One of the most popular recent meetings covered welding and welding technique. Feature of the program was the showing of the General Electric Company's six-part sound color film, "The Inside of Arc Welding," covering: (1) welding fundamentals, (2) flat position, (3) horizontal position, (4) alternating current, (5) vertical position and (6) overhead welding technique. More than 300 invitations were sent out. Predicted attendance was 50 to 60. Provision was made for 100—actual attendance was 182.

At the close of the meetings conferees are usually invited to the company electric kitchen for simple refreshments. Here company representatives are on the job serving and getting acquainted with customers and making every one feel at home.

Future subjects for meetings usually take care of themselves through the requests and suggestions of "students." The series will not adhere to any fixed program or schedule, but its continuation and subject matter will be guided by the interests and needs of the men in attendance. To date the meetings have been a thumping success; their future is assured for some time to come.

•

Rewind Meter Coils With Formex Wire

Successful use of No. 12 "Formex"-coated wire for rewinding current coils of Westinghouse type OA watthour meters is reported by E. F. Havens, superintendent of meters, Des Moines (Iowa) Electric Light Company. Where current coils of these meters have been burned it has been recent practice to apply 14 turns (seven on one pole, seven on the other) instead of 30 turns of "Formex" wire on the current coil and rate the meter as a 10- instead of a 5-amp. meter. Accuracy of the rewound meter compares favorably with that of the original 5-amp. meter, it is stated.

Simultaneously with the rewinding of the current coil the register ratio is changed from 4,800 to 2,400 by a slight alteration in the register gearing. While it might be possible to rewind the current coil of the OA type meter for 15 amp., this has not been done at Des Moines, since it was felt that the turn ratio might be too high for the damping magnet supplied with the meter.

Current coils that have been wound with "Formex" insulated wire are coated with red glyptal paint before being put in service and have been subjected to ground tests at 2,300 volts without breakdown.

PRIORITIES PROBLEMS

How *CMP* Works

The time has come when utilities must get a working acquaintance with CMP. That's the alphabetical abbreviation of WPB's famed Controlled Materials Plan, which is to regulate the flow of all steel, aluminum and copper during the war period. Beginning April 1 shipments of controlled materials will be made partly under CMP and partly outside its scope; after June 30 no deliveries of controlled materials will be made without a CMP allotment identification.

Utilities will work with CMP in two ways, to obtain controlled materials for construction and facilities and to obtain them for maintenance and repair. In the former category CMP means additional paper work in the shape of Form CMP-4C, which is the application for controlled materials needed for specific projects. For maintenance and repair a procedure is being worked out within the framework of Order P-46 whereby CMP allotment numbers may be self-applied much as are P-46 ratings now.

Utility Application

There is an immediate application of CMP for utilities with construction work and facilities expansion already approved, and a continuing application in connection with all future construction and additions. This immediate task is that of integrating into the CMP machinery the backlog of utility projects which have previously been approved on PD-200 (construction), PD-1A, PD-545 (housing) and P-46 letter applications. WPB's Power Division, now a part of the autonomous WPB war utilities agency under J. A. Krug and as such a direct recipient of an allotment of controlled materials, is ready for this phase of the job; it is ahead of other WPB units in this respect.

The procedure for obtaining a CMP allotment number for previously authorized projects involves filing with the Power Division a CMP-4C for each individual project that will require deliveries of controlled materials after March (permissive) or after June (mandatory). Inasmuch as deliveries of controlled materials during the second quarter will be made first to orders bearing CMP allotment numbers, second to those without them, it is distinctly to utilities' advantage to get their projects under CMP for all deliveries after April 1.

How to Prepare and File

How should a utility go about preparing and filing CMP-4C's? First, a couple of definitions and explanations about the mechanics of the plan. Aluminum, copper and steel are the only CMP materials right now, but control is exercised over each of a number of specified forms of these metals and each specified form is individually a "controlled material." Also, there are Class A and Class B products. Allotments of controlled materials for Class A products required as part of a utility construction job must be obtained by the utility and passed along to the fabricator. Allotments of controlled materials for all Class B products are made directly to the manufacturer. Official lists of controlled materials and of Class B products are obtainable at any WPB field office. Anything not listed as a Class B product but which contains controlled materials is automatically a Class A product—for utilities, such items as steam engines, boilers, forgings, fabricated structural steel, etc., are examples.

Before attempting to fill out CMP-4C's it is a necessity to have both the list of controlled materials and of Class B products—too long to print here. A copy of CMP Regulation 1, the "bible" of the plan, and the Power Division's recent Administrative Letter on CMP also are essential working tools.

In preparing a CMP-4C application a utility lists, in the detail specified on the blank, the quantities of each type of controlled material required for delivery from supplies in each month after March. This schedule is to include not only controlled materials required in original form but also the controlled materials required in the manufacture of all Class A products which are to become a part of the completed job. Controlled materials for the manufacture of Class A products are listed for delivery in the months that the manufacturer will need them.

Example

For example, suppose a project calls for delivery of a certain equipment in November, 1943. The manufacturer may need plates in June, bar stock in July and tubing in August. These materials are listed on the utility's CMP-4C as required for delivery in those months. Carry the procedure another step—suppose the manufacturer needs forgings in July, for which the forge shop requires billets in May. On the utility's CMP-4C application the required amount of billets is listed for May delivery. In any complicated utility construction job some materials inevitably will have to be traced back not two but several steps to the controlled material level.

But how does the utility know when the forge shop needs billets and the manufacturer needs plates? Un-

℞ THERE'S A WAY UTILITIES can cut down their own volume of paper work in preparing CMP-4C's and save considerable time in getting many war jobs under way to boot. WPB's Power Division is ready to fill out, in Washington, the CMP-4C forms on most PD-1A and P-46 letter applications, returning CMP allotment numbers and the required allotments of controlled materials along with the authorization to proceed with the job. Utilities can help, by including in PD-1A and P-46 letter applications a statement of the month or months in which deliveries of controlled materials will be required, and the kinds and amounts needed. In time, CMP-4C's probably also can be prepared in Washington for many PD-200 project applications.

CMP it's the utility's job to get e "bills of materials" from its pliers.

hus, the utility's job in preparing MP-4C to send to Washington is correlate the requirements of its pliers, add in the schedule of deries of any controlled materials uired direct from mills or dealers original form—wire and cable, instance—and transcribe them all a single blank.

ne other bit of information is ntial on these applications—ntification of the WPB authorizaof the project, whether from a -200, PD-1A, PD-545, or P-46 r application, together with the and the priority rating assigned , where applicable, the serial nber and expiration date of the horization. Also, for projects upon ch work starts prior to April 1, breakdown is required for each trolled material showing the estited amount which will be delivd before April 1 and a statement the percentage of the total dollar ue of the project it is estimated l be completed by that date.

Much Is Left Out

hat is what the utility does sup- on CMP-4C's. What is omitted equally important. CMP-4C's st cover only quantities of conled material to be obtained from ls and dealers. Do not include ntities of controlled materials to used on the project from excess cks, or which are to be purchased m another company's excess intory. Also, do not include conled materials used in fabricating ss B products to be used in the ject.

CMP-4C's for utility projects aldy authorized by WPB under exing priorities procedures may be d any time—the sooner the bet- CMP-4C's for projects apoved hereafter by WPB should not prepared until construction auorization is received. In other rds, use of the PD-200, PD-1A, -545 and P-46 letter Application ms is retained under CMP for taining authorization to proceed. P allotments aren't requested unapproval is granted because in ny instances specifications are nged or schedules for construcn altered to fit war conditions.

Questions and Answers (on P-46-c)

Q—What is the purpose of Supplementary Order P-46-c?

A—It is the enabling machinery for a government war program to electrify certain farms near existing rural distribution systems where power will be used to operate specified types of equipment for farm production, thus alleviating the farm labor shortage and increasing food production.

Q—What farms are eligible for P-46-c extensions?

A—Farms requiring an extension of not over 100 feet per "animal unit," but not more than 5,000 feet from an existing distribution line.

Q—What is an "animal unit"?

A—It is the Department of Agriculture's method of rating farm productivity for this program. One milk cow equals one unit, as do three brood sows, 160 lambs in feed lot, etc. Thus a farm with ten milk cows, three brood sows and 160 feet lot lambs per year would be eligible for a 1,200-foot extension.

Q—For what types of equipment may an extension be made?

A—The order stipulates that the farmer must have, be able to get without priorities or have an AA-5 or higher priority rating with which to obtain one or more of the following: Water pump for livestock, milking machine, milk cooler, incubator, brooder or feed grinder. Also there must be no other means of operating such equipment on the premises.

Q—Who determines a farm's eligibility for an extension?

A—Certification that the farm is eligible both within the spirit and the letter of the order is made to the utility by the Department of Agriculture County War Board.

Q—Are there any limits to the kind of construction permitted?

A—The order restricts primary extensions (that is, the 100-ft. per animal unit of new line from the distribution tap) to single-phase No. 6 galvanized steel wire. Copper-covered steel wire or No. 4 or No. 6 A.C.S.R. conductor may be used if the utility has it in excess stocks. Secondary lines and services are restricted to 30 pounds of copper by weight for any customer.

Q—What is counted in the 30 pounds of copper?

A—Only secondary lines and services installed by the utility—usually the drop to the meter box. Farm wiring to barns, etc., is not part of this quota.

Q—Can copper or Copperweld conductor be used at all for primaries?

A—Not copper, but Copperweld-copper and Amerductor will be permitted until April 1 in individual cases approved by WPB where steel wire is not yet obtainable and the extension is urgent.

Q—Is WPB authorization required where County War Board certification has been obtained?

A—Not where steel wire is to be used. When Copperweld-copper or Amerductor is to be used specific approval in advance is required.

Q—How is this approval obtained?

A—Apply to WPB's Power Division by letter, stating (1) that the extension is within the limits of P-46-c—cite the CWB certification; (2) the amount and kind of conductor to be used, and (3) the reasons why construction cannot be deferred until steel wire is available. A good reason might be that the farmer is ready to connect a chicken brooder.

Q—Is WPB making stocks of steel wire available for this program?

A—Certain steel mills can fabricate on receipt of AA-5 orders. Others will require AA-1 available under the forthcoming amendment to Order P-46.

Q—Suppose a farm has sufficient "animal units" to be eligible for service from either of two utility lines. Which provides service?

A.—Service must be obtained from the nearest line which can supply it.

Q—May the farm home be wired for lighting and appliances?

A—The order simply requires that service must be used to operate one of the specified types of farm equipment. It can also be used to light the house if the house can be wired, or is wired.

Editorials

S. B. WILLIAMS, *Editor*

Down for the Second Time

FOR the second time in the history of electric service average residential usage has turned down. In 1933 it went from 597 to 595 kw.-hr. This year, a decade later, it will suffer a much more serious setback.

The statistics indicate that while no break-through occurred nationally, in any month last year, although some came dangerously close, it was likely that the January, 1943, average would be below that for January, 1942, and the difference might widen.

There is no way of knowing how much of this is due to the virtual elimination of appliance merchandising and promotion or to lessened use in homes from which men have gone into the services, but there can be no doubt but what a large part of the fall-off is due to a public impression that electricity is short in supply and must be saved. The public does not know that there is an ample supply of electricity. Of course, nobody should waste electricity, because a kilowatt-hour wasted is the same as wasting more than a pound of coal. But there is a difference between wasting and not using electricity adequately to get the best light or convenience.

Some companies are reluctant to promote adequate use at these times for fear the public might think it was unpatriotic. Then how about showing that adequate use of electricity is a war duty?

If women used a broom in place of a cleaner or the washboard in place of the washer, how many would be available for Red Cross and other civilian war jobs? How many would have time to shop under the restrictions of rationing of food and gasoline?

What effect has inadequate light on eyesight and accidents?

Does the refrigerator not save food? Should one dare with the old-fashioned icebox to get along with less frequent deliveries of milk and other foods?

While there are, here and there, some distinctly electrical luxuries in homes, almost the entire consumption of residential energy is for some useful purpose, the reduction of which will be harmful in some way to the individual and to the war effort.

Surely, if stores can urge the purchase of costume jewelry made from metal and of other civilian non-essentials without public criticism, the more abundant usage of electric service can be promoted.

Today people are merchandising coffee, and it rationed. They are merchandising tires, and they rationed. They are merchandising gasoline, and it rationed. Are they merchandising electricity for r dential usage? It isn't rationed.

War Essential Employee

EXCEPT for the elimination of departmental assistant recently revised list of essential occupations in the uti industry is pretty much the same as the original list last June. The reduction of titles from 86 to 51 w accomplished principally by combining jobs under single head. Thus, where the different kinds of forem are classified in the original list, they are now lump under the single heading of "foremen."

The department assistants that were recognized the first list include such occupations as insurance, t rates, reports, legal, clerical and other non-power prod tion operations. Since these same jobs have been deni classification as essential to the war effort in other indu tries, no exception could be made in the utility indust in spite of the fact that much of the work is necessitat by the demands of governmental agencies for the prepar tion of material for hearings or reports.

The Manpower Commission, in making this decisio is not questioning the importance of the work these m are doing. It is merely operating according to the poli that only such occupations as contribute directly to t war effort can be classed as war essential. It is not ho important a man or a job is to an employer, but rath how important to the war effort.

When reviewed in this light it is obvious that t commission could make no different decision. It m cost the utilities some men, but are not the key men in t jobs affected for the most part over the present draft ag

Block Power Competition

ANNOUNCEMENT is expected shortly of a ne approach to packaged power competition with utili service, to be merchandised as block power or joi ownership by consumers within a block.

In many respects this is but another phase of th co-operative movement which is gaining ground he and there. Unlike the REA movement, however, its pr mary purpose is not to extend service to those not no getting it, but rather to replace central station servic with something at lower cost. That is always an allurin bait for a public that does not know the elements of co and service.

While we have no reason to question the qualit of the equipment that will go in this packaged unit, w wonder if its representation will be free from deception If the sale is put on the competitive basis of price pe

kilowatt-hour delivered, will the salesman be talking about the same kind of a kilowatt-hour or something that will be less desirable?

That has always been the point of conflict, and because the packaged unit salesman had little to offer but price he had to let the customer get an erroneous impression, for only so long as the customer believed he was getting the same article was it possible to talk price.

This is probably but the forerunner of several plans for the post-war period to compete with power company service. The utilities cannot afford to wait until these programs are in full swing, but should begin now to impress on the public mind the kind of service received in relation to its cost.

No packaged plant can ever compete on price for the same service. There can only be competition when the public either doesn't want the same service or is allowed to think that by some hocus-pocus the service is the same.

The 48-Hour Order

UTILITY MEN and others have been asking what the effect of the 48-hour-week order will be. Right now it applies to some 32 critical labor areas and is expected to be extended shortly to perhaps another hundred areas.

The order was issued for one purpose only and that was to provide an additional labor supply. War industries rather generally are on the longer week, so that this order in effect is a method for drawing off labor from non-war-plant employers.

It will definitely release labor. The Hartford Electric Light Company and the Connecticut Power Company both went to 48 hours last fall. The immediate reduction in number of employees was 11 percent for the former and 15½ percent for the latter, which figure has later been increased. Other companies in the affected areas indicated that the change would release men.

What will it cost? That depends. The extra cost for overtime can be anywhere from nothing to perhaps 5 percent. It will not have the full effect of straight time and overtime. Managements that are running on very slim cost margins will find some way to balance the increased costs through the release of more workers.

Of course, a great many utility companies have been on a 42- or 44-hour week for some time. In those cases the effect will be less. There will, however, still be the job of rearranging schedules of operators.

The problem with the office staff may be greater than with the operating men. The schedule of hours is less likely to produce a corresponding increase in output per worker, with the result that the number of people that can be released may not be proportionately as great.

There is a large number of problems that face the Manpower Commission on this order. The suggestion is made, therefore, that employers in an affected area set up the steps for going to 48 hours and indicate the labor that would be released. Beyond that, it would be wise to wait for a clearer picture of the local labor requirements and the manner in which the surplus labor will be accommodated.

Employers outside the affected areas will be encouraged to go to the 48-hour week only provided it means greater production, but not to release workers. The commission need have no fears in that direction. It would be well, however, for all employers to have a plan ready because there is no way of telling when and where a labor shortage area will develop.

Suspended Orders Settlement

AS THE war plant construction program draws to a close manufacturers are becoming more concerned over the disposition of orders on which work has been suspended by WPB. There is a considerable volume of "held and stopped" partially fabricated equipment for utilities. The orders were not cancelled, merely suspended.

Will the utilities accept delivery after the ban is lifted? If not, who will pay for the work to date? Can it be scrapped now or must it remain on the books until such time as a cancellation is received? Just what is the status of such "work in suspense"?

The government has taken no steps to set up a policy. There are no indications, at least for the moment, that the government has any intention of bailing out a manufacturer from such losses except through the excess tax route. What position the customer will take is not known, except that it is less likely that delivery will be desired after the emergency, especially when so many utilities are now wondering how they will dispose of the surplus capacity that will result when war industries are closed down.

If the question of responsibility for losses under such circumstances is left for litigation to decide, justice might well rule that war necessity overrides normal legal interpretations and that the responsibility is jointly that of the supplier and the customer. Inasmuch as ninety percent of the out-of-pocket loss for most manufacturers can be absorbed in excess tax deductions, and is so being absorbed now by some, it would seem that friendly negotiation could settle the difference with the minimum disturbance of commercial relations. Since it seems highly unlikely that very many of these suspended orders would be reinstated at least for some time after the emergency, it might be advisable to treat them as canceled and proceed at once with settlement negotiations. In order that no customer, because of size, may take advantage of a supplier, or *vice versa*, some ground rules as suggestions or guides in a negotiation would seem desirable. Could not a start be made on such suggestions or guides now by a representative committee of customers and suppliers, appointed, perhaps, by their respective national associations?

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

Manpower Muddle

A RADICALLY changed approach to the increasingly acute manpower problem is developing in Washington. The Selective Service Act is being used by the War Manpower Commission as a tool for pushing workers with families into war jobs. The popular "work-or-fight" phrase isn't fully descriptive. More aptly, it's "work where we want you to, or fight" that is replacing personal dependency considerations.

First articulate step in this direction is WMC's order withdrawing after April 1 all deferment from military service, regardless of family situation, from 18-to-38-year-olds in 29 occupations and in any job in 36 industries and businesses.

The action is not designed primarily to increase the pool of 1-A men available for military induction. Rather, it is calculated to induce workers in those activities which are inferentially labeled "non-essential" to shift to war work. That fact was made amply clear in the explanatory publicity which accompanied the deferment cancellation order.

3B vs. 3A

This positive step for shepherding workers into essential war activities is a logical, but drastic, follow-up of a previous indirect maneuver which failed. That was creation last year of the 3-B draft classification—men to be called after 3-A men of similar family status—to which all workers with dependents in any industry termed essential to or in support of the war effort were made eligible.

The 3-B category was offered as an attraction to induce men to shift jobs. The idea was that the drugstore clerk with a family would get a job on a war plant assembly line and be that much lower on the draft lists. Largely because overworked draft boards haven't bothered, for the most part, to segregate their 3-A and 3-B registrants, and because WMC didn't "sell" the idea, the "bait" didn't catch anything.

Thus was born the policy of point-blank telling military age workers to get out of specified jobs into war work or into the army. "To justify its (dependency) acceptance as a ground for deferment, a worker must also be making a contribution on the home front," said WMC Chief McNutt in announcing the move. WMC looks kindly upon such management programs as that of Capital Transit Co. in Washington, which has geared its advertising for bus and trolley operators to a tune of: "How does the work-or-fight order affect you—here is an essential war job."

Essential Civilians

Results of the new policy, however, have not been too happy! There has been a mad scramble among workers in civilian occupations for war plant jobs. Not just among those in jobs listed in the order, but also among workers in laundries, retail stores and similar activities, many of them essential to the home front. They acted because WMC promised that the non-deferable list would be expanded—it was somewhat like telling the public that canned goods would be rationed in a month or two.

The scramble has not been limited to the 18-to-38-year-olds, either. Older men, doubtless fearing that their employees will have to close up shop, are joining the parade. So serious a view does WPB's Office of Civilian Supply take of this trend that it is threatening to refuse further responsibility for maintaining a minimum home front economy unless it gets recognition in the labor picture.

A more philosophical objection raised against WMC's action is rooted in the charge that the program stultifies the draft act. Getting into the right job is promoted as a means of escaping or delaying the day of military induction. It's a false premise, furthermore, if ten out of fourteen military age men are to be in service by the end of the year—which is the fact under the 11-million-man armed force program that is being carried out.

There is also the bitter Congressional condemnation of the program for its taint of executive fiat—also for the political value of opposing the drafting of fathers. Why not a National Service Act if men must be transferred from one industry to another? Under WMC's program, men who desert the non-deferable occupations for war jobs don't even have the job-return guarantee of men called into military service.

Labor Priorities

Where is WMC heading? The deferment cancellation policy is not an isolated maneuver, although it was cooked up in a corner by the agency's "idea boys." It was adopted because it is considered to fit into WMC's embryonic plan for a system of labor priorities and allocations. Because, also, it offers a stop-gap replenishment of the dwindling labor supply until something else can be done.

The simple fact is that the government—and this includes Congress—is fumbling toward inevitable manpower allocation in the same faltering step-by-step fashion that it reached materials allocation.

But WMC does now have the skeleton shape of the two extremes of a labor priority system. For months McNutt's agency and Selective Service have been building a list of critical occupations which are classified as eligible for draft deferment. A few experiments in "labor freezing" have been undertaken with extremely critical skills in labor-shortage areas. Now the deferment cancellation program creates a classification at the other end of the line—of occupations which can be virtually closed out, to men at least.

Still to come before there is any orderly priority program are two more major steps. One is classification of the relative importance of the jobs in between—that's the problem which is causing WPB's Office of Civilian Supply its headaches. The other is some sort of a one-way escalator which permits workers to ascend the priorities job ladder, but not descend.

NEWS OF THE WEEK

Sees No Power Shortage for War or Civil Needs

J. A. Krug, in first public statement as nation's power "czar," commends job done by utilities in providing adequate power supply, in contrast to many other vital necessities

There is no shortage of power and there will be none for war and essential civilian requirements! Power men—public and private alike—should be proud of the job they have done, and are doing, in providing power supply for the war effort!

That is the "keynote" voiced by J. A. Krug in his first public statement since becoming the nation's wartime utilities czar as Director of WPB's new Office of War Utilities. The former manager of power for the Tennessee Valley Authority went down among "home folks"—to a meeting of TVA distributors at Chattanooga, Tenn., on February 16—to deliver what is considered a major public statement of WPB's position on this subject.

Power No Limiting Factor

Characterizing power as the "life blood" of war production, Krug said:

"It is reassuring to know that electric power will not be a limiting factor in all-out war production, and that wherever war loads must be carried, electric power will be there in adequate quantities.

"War production has been following a steadily increasing curve since 1940. During 1942 the rate of increase reached its maximum. The tremendous expansion in war power requirements and all civilian needs were carried successfully by the power systems of the country. Existing installations and power plants now under construction will be adequate for the still larger requirements projected for 1943."

Krug pointed out that peak loads on Class 1 utility systems in 1942 aggregated about 33,000,000 kw. To serve this, he said, there was dependable capacity of 41,200,000 kw. The 1943 peak load, Krug said, "should not exceed 38,000,000 kw.," and to serve this there will be 45,100,000 kw. of dependable capacity by the end of the year. Tight spot in the year, he warned, will come next fall, because a large amount of the projected new capacity is scheduled for installation in the late months of 1943.

Krug spoke beyond his immediate audience to commend all the nation's power men for the job they have done.

"The power men—public and private, in this area and throughout the country—should be proud of the job that has been done in providing power supply," he said. "Power has never been 'too little or too late.' There is today no shortage of power. This is in sharp contrast to the situation as to many other vital necessities. I do not know of a single instance in which the operation of a plant has been delayed by lack of electric power supply. . . . I repeat, the power men of the country can be proud of the job that they are doing."

Utilized Existing Plant

This pride, he continued, can go beyond the satisfaction of having provided adequate supplies. "The job has been done with the minimum possible interference with the rest of the war program," he said, adding:

"From the outset, we have recognized our obligation to assure enough power for our war program. We have also recognized our obligation not to overbuild power plant at the expense of other essentials. We had to be sure that we were getting the utmost out of our existing plant; that we were utilizing to the full the ingenuity and the resourcefulness of our utility systems to get by during this war emergency under less than ideal conditions; to assume calculated risks when necessary; not to ask for more materials and more equipment than we absolutely needed."

Krug enumerated some of the major conservation steps which have been taken along these lines—inauguration of national War Time, which he said reduced the 1942 peak by at least one million kilowatts; regional pooling, which started with the 1941 drought in the Southeast and now has spread to all areas to "create" at least 1,250,000 kw. of additional firm power supply,

Eberstadt Out; Wilson to Run WPB

Ending jurisdictional disputes within the War Production Board, Donald M. Nelson, board chairman, in a surprise move this week, ousted Ferdinand Eberstadt, WPB vice-chairman, and promoted Charles E. Wilson, former president of the General Electric Co., to be executive vice-chairman in complete charge of all war production programs.

"Under my supervision," Mr. Nelson said, "Mr. Wilson will have full authority to make the necessary decisions to carry out the WPB production programs for aircraft, escort vessels, rubber, high-octane gasoline, merchant vessels and all other war items. I am confident he will continue to keep production going up."

and careful scheduling of the essential components of each new power project. The power czar particularly commended the "unselfish action" of public and private power systems for "pushing into the background differences of opinion and policy" to effectuate pooling arrangements.

Despite the over-all healthy picture for war power supply, Krug pointed out the possibilities of having to curtail non-essential uses of electricity in localized areas in the event of major generating failures or sabotage. He warned also of the "serious difficulties" in fuel transportation and referred to recent suggestions for dousing decorative and display lighting as a means of conserving coal, oil and transportation.

"Whether or not such a dimout is needed is a matter which must be determined by the government agencies primarily responsible for fuel and transportation," he said. "Some persons mistakenly believe that a nation-wide dimout is being advanced to take care of a power shortage. There is, of course, no need for a dimout of the nation's cities from the standpoint of power supply because there is no present or impending shortage of power capacity."

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Sickler Appointed OWU Power Director

Officially, it's the Office of War Utilities, with J. A. Krug as War Utilities Director.

That is the title for the new independent agency established within WPB with exclusive jurisdiction over electric power, gas, water and communications (except radio). The administrative order setting up the office and outlining its duties and responsibilities was signed February 13 by WPB Chairman Nelson. Formal delegation to the agency of WPB's authority over utilities followed by three weeks Nelson's announcement of Krug's appointment. Authority conferred on the new agency parallels that which it was announced Krug would have (ELECTRICAL WORLD, January 23, insert page opposite page 126).

Coincident with the effectiveness of the administrative order, Krug announced the appointment of Barclay Sickler, who had been deputy chief of WPB's Power Division, as director of the Power Division in OWU. Krug also announced that Edward Falck, formerly chief of the Power Division's Supply Allocations Section and more recently Krug's assistant in WPB's priorities bureau, has been named deputy director of OWU.

"Death Sentence" Fight Carried to Supreme Court

North American Co. petitions for review of Circuit Court decision upholding SEC order requiring divestment of all properties — Constitutionality of Section 11 up for final test

The first holding company in the electrical industry to challenge the constitutionality of the "death sentence" provisions of the Holding Company Act in the U. S. Supreme Court went on record recently with the filing of a petition by the North American Co. for a review of a U. S. Circuit Court of Appeals decision upholding the Securities and Exchange Commission's order requiring the company to divest itself of all but one of its properties.

Court Affirmed SEC Order

In upholding the SEC on all counts on its action brought against North American, the lower court affirmed the original commission order of April 14, 1942, requiring North American to divest itself of some 80 subsidiaries under Section 11 (b) (1) of the act, except the single system comprising the Union Electric Co. of Missouri (ELECTRICAL WORLD, January 23, page 127; November 7, 1942, page 9; July 4, 1942, page 4; June 20, 1942, page 6). The lower court also denied the contention of the company that retention of securities is a purely intrastate matter and beyond Congressional power to regulate under the commerce act, and that the Fifth Amendment to the Constitution, the so-called "due process" clause, had been violated by the SEC action.

North American's petition for a review of the Circuit Court decision, presented by Charles Evans Hughes, Jr., company counsel, argued that the company had been conservatively financed, had had no default on its securities, and that the system's electric rates are far below the national average. The "death sentence" order, the petition said, will cause undue hardship to many stockholders—not alone in the North American system but in many other utility holding companies.

"The assets of which petitioner is ordered to divest itself," Mr. Hughes said, "consist wholly of securities of other corporations. The ownership of securities does not of itself constitute engaging in interstate commerce. An intrastate matter, such as the ownership of securities, is not within the reach of the federal power unless it so affects matters which are interstate that its control is necessary to protect the latter. However, in such cases there must be a specific finding that interstate commerce is affected. And this finding must be made by the court, the commission, or the Congress. . . .

"In the case at bar the commission concededly made no finding that the ownership of the securities of which it ordered the petitioner to divest itself, or of the ownership of any of them, affected interstate commerce. The Circuit Court made none. It affirmed the orders of the commission on the theory that Congress itself had made the necessary findings. However, the only general finding that Congress made is that public utility companies are affected 'with a national public interest.' Such a finding is insufficient as a basis for federal jurisdiction under the commerce power. . . ."

Mr. Hughes further contended that substantially all abuses are eliminated through the far-reaching regulatory sections of the act, other than the "death sentence" provision. In view of this, he said, "the contribution which enforcement of that section would make to the Congressional purpose of eliminating abuses in the public utility field would be slight. . . ." On the other hand, he said, enforcement would deprive the petitioner of important property rights and visit upon its stockholders enormous destruction of values.

Withdraws Stock Petition

In an unrelated action, but one which has a bearing on the case, the Securities and Exchange Commission has granted the application of North American Co. to withdraw its petition for the disposal of all of its holdings of the common stock of Union Electric Co. of Missouri. The original petition was filed January 21, 1942. The holdings consist of 2,695,000 shares of common stock — all the outstanding common of Union Electric. On February 2, 1942, the North American Co. filed a registration statement covering the sale of the stock to a syndicate headed by Dillon, Read & Co., for sale to the public. Delaying amendments have since been filed by the company on the grounds that "unfavorable market conditions" prevented the offering.

P-46 Revision Issued as Basic Utility Regulation

Higher priority ratings, tighter controls on inventories and mandatory exchanges of excess inventories included in new Order U-1 of WPB's Office of War Utilities

The long-delayed revision of Order P-46 was issued this week with higher priorities ratings, new procedures integrated into the Controlled Materials Plan, tighter controls on inventories and mandatory exchange of excess utility inventories to conserve use of critical materials. The order was retitled as Order U-1 and thus becomes the basic regulation of WPB's new Office of War Utilities.

March 31 CMP Rules

In accordance with previously announced WPB policies, the new order makes available the top priority of AA-1 for deliveries of all repair, maintenance and operating supplies until March 31 and an AA-1 rating for deliveries of other than controlled materials after that date. Existing orders should be rerated with suppliers under the new authority.

After March 31 deliveries of controlled materials for repair, maintenance and operating supplies are to carry only a CMP allotment symbol—MRO-U, with no priority rating. Except for orders requiring aluminum, which must be specifically authorized by OWU in Washington, the CMP symbol may be self-assigned by stamping upon purchase orders a manually signed certification as follows:

"CMP allotment symbol MRO-U. The undersigned certifies, subject to the criminal penalties for misrepresentation contained in Section 35A of the U. S. Criminal Code, that the controlled material covered by this order is required for use in essential maintenance, repair or operating supplies and that delivery thereof will not result in a violation of the restrictions of paragraph (f) of Preference Rating Order P-1."

This is a different wording for self-certification than has been used with P-46 priority rating. Similar language is also now required for assigning the AA-1 rating.

Priorities for construction of service facilities to war projects remain the same as in the old order, with procedures revised to include use of CMP symbols for controlled materials.

Delivery, withdrawal and inventory restrictions have been sharply revised in the new order. The changes tend to freeze operations to the experience of recent months. Utilities may not schedule deliveries, by classes of materials, for any quarter in excess of one-third the dollar value of materials withdrawn from stock in the last nine months of 1942. Deliveries may be accepted, however, on the basis of the October 10, 1942, inventory limits of P-46 until March 31. After March 31 inventories are limited as follows: For transmission and distribution, meters, wire, cable and busbars, wood poles and crossarms —four-thirds of withdrawals during the last nine months of 1942; generating station—1940 inventory plus the ratio of increased output; switching and substation—1940 inventory; all other materials—two-thirds the aggregate dollar value of withdrawals in the last nine months of 1942.

Withdrawals, like scheduling of deliveries, are limited in any quarter to one-third the withdrawals in the last nine months of 1942. Existing emergency provisions for excess withdrawals are left virtually intact except the provision for "short item" purchases. Short items are now defined as those for which inventories are less than a 90-day supply and purchases in excess of quotas may be made only after separate accounting has been set up for excess inventory in all classes of material and the surplus listed for sale. In other words, excess stocks are to be treated as if they belonged to another company.

A new inventory restriction limits the amount of listed controlled materials on hand for construction work (non-repair and maintenance) to 60 days' stock.

The mandatory procedure for exchange of excess inventories becomes March 31. It provides that no purchase of listed materials — including wire and cable and bus, transformers, meters, circuit breakers, disconnects, insulators, etc. — amounting to more than $100 may be made without first attempting to obtain them through the Regional WPB Utility Inventory Control Office from another company's excess stocks.

These regional offices are now being established by the Inventory Control Section under Charles Kohlhepp (ELEC-

ENGINEERS POOL IDEAS—Nearly 100 members of the Overhead Systems, Underground Distribution and Electric Lines Club groups of New England utility engineers held their first joint meeting in Boston February 10 to discuss wartime operating problems. New tunnel and 110-kv. line construction, salvage and substitute materials featured the program, with a talk on "Steel Wire in Rural Line Work" by E. O. Wahlstrom, transmission engineer American Steel & Wire Co., Worcester, Mass. At the head table, l. to r., seated—C. F. Avila (Boston Edison), chairman Underground Distribution Engineers of New England; H. D. Gfrorer (New England Power, Malden), vice-chairman and secretary, foregoing group; F. A. Hubbard (New Bedford Gas & Edison Light), president Electric Lines Club, and Ray Pike (Lowell Electric Light), chairman Overhead Systems Committee. Standing, l. to r.—E. G. Stebbins, Elwood A. Church and O. F. Mann (Boston Edison), and R. F. Burnham (Connecticut Power, Stamford), vice-chairman and secretary Overhead Systems group

TRICAL WORLD, January 2, page 3). To insure that the exchange plan works, another provision in the new order permits WPB to withdraw priorities from any utility which refuses to sell excess material, or even regular inventory material for emergency repairs, on a bona fide offer from another company.

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Work Progressing on Wisconsin Unit

Second 80,000-kw generating unit at Port Washington station of Wisconsin Electric Power Co., now undergoing expansion, will go into preliminary operation August 1, 1943. First commercial operation is scheduled for September 1, 1943, according to a recent statement of G. G. Post, vice-president in charge of power of the company.

Work is currently progressing on the condenser installation and other equipment has been delivered and is ready for installation, it was stated. The 690,000-lb.-per-hour pulverized coal-fired boiler, which will deliver steam at a throttle pressure of 1,230 lb. and a temperature of 850 deg. F., is complete.

The second unit will be substantially the same as the No. 1 unit of this station, which until recently held the record as the world's most efficient steam station. Differences rest in use of hydrogen cooling for the generator and in the increased heating surface of the boiler. Steam temperature for No. 2 unit will be 25 deg. F., higher than for No. 1, it was stated.

$1,000,000 Lopped from SEC-FPC Budgets

SEC suffers $750,000 cut and FPC $250,000 in independent offices appropriations for 1944 fiscal year — TVA gets unexpended balances and revenues approximating $124,800,000

Budget reductions totaling $1,000,000 were imposed on SEC and FPC by an economy-minded House appropriations subcommittee which allowed TVA its requested quota in anticipation of possible capacity increases. The appropriations are contained in the independent offices bill reported to the House for passage this week.

SEC Cut Heavily

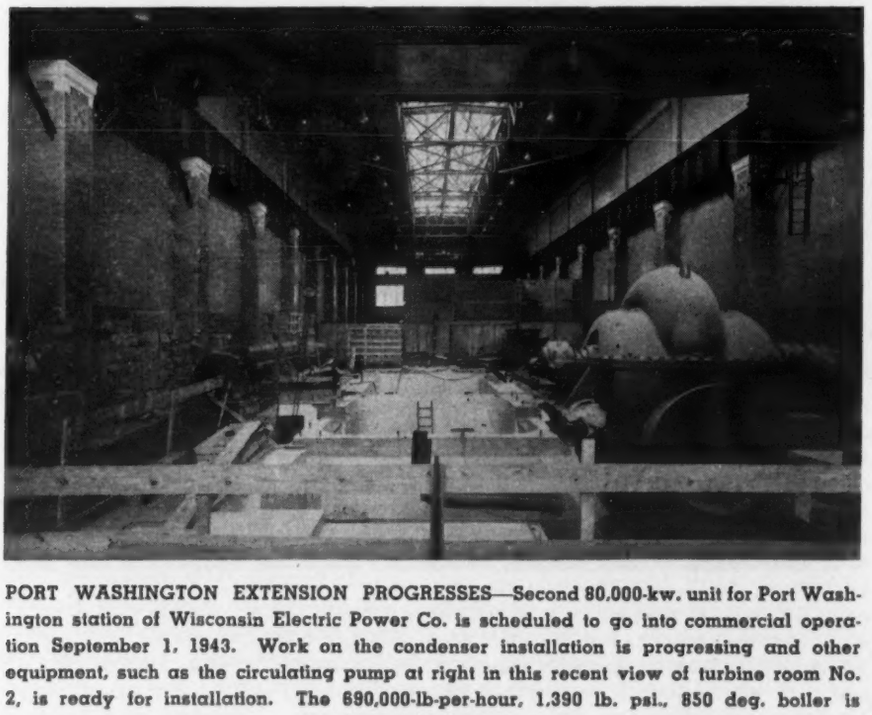
SEC suffered most heavily when the subcommittee on independent offices lopped $750,000 off budget estimates for the fiscal year of 1944, which opens July 1. Appropriated for the coming fiscal year was $4,048,000, less than the fiscal 1943 appropriations by $862,000. FPC was cut $250,000 from budget estimates and was granted $2,244,255, including $519,255 for national defense purposes. Allowance for salaries and expenses was reduced by $200,000, and that for flood-control surveys by $50,000, because, the report said:

"In recommending such reductions, the committee was of the opinion that many of the normal activities of the commission, including investigations into power-development possibilities of proposed flood-control projects, can be further retarded or suspended and that trained personnel engaged in this work can be shifted to the defense roll of the commission or assigned by the Civil Service Commission to work more closely related to the war."

TVA, which asked for no new funds, was granted a reappropriation of an unexpended balance as of June 30, 1943, estimated at $62,800,000, as well as receipts during fiscal year 1944 estimated at $62,000,000. The large unexpended balance was caused by WPB deferment of numerous projects approved by Congress last year.

Included in the funds for TVA is a reserve "kitty" of $17,500,000 to be available for starting quickly any of the agency's power generating or other construction projects which have been deferred by WPB for lack of materials. Testimony by TVA Chairman Lilienthal before the appropriations subcommittee disclosed that WPB has asked that all federal construction agencies be allowed to have a similar reserve fund for this purpose.

Government hydro-electric projects authorized by Congress totaling upward of 2,000,000 kw. were deferred last year by WPB in fitting power expansion to war needs. It is known that the Power Division is reviewing the 1944 power requirements to determine finally whether additional capacity will be needed in that year to meet changes or increases in the war program. Because of the time factor in installing generators decisions must be made 15 to 18 months ahead, but WPB seeks to cut this period to a minimum by keeping the federal agencies in a financial position to begin work at once if the need arises in areas served by government projects. Present indications are, however, that only a small amount of capacity—if any—will be added to WPB's present program.



PORT WASHINGTON EXTENSION PROGRESSES—Second 80,000-kw. unit for Port Washington station of Wisconsin Electric Power Co. is scheduled to go into commercial operation September 1, 1943. Work on the condenser installation is progressing and other equipment, such as the circulating pump at right in this recent view of turbine room No. 2, is ready for installation. The 690,000-lb-per-hour, 1,390 lb. psi., 850 deg. boiler is substantially complete

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Heacock Appointed to Krug's Old Job

Successor to J. A. Krug as WPB's Deputy Director General for Distribution is B. C. Heacock, chairman of the executive committee of the Caterpillar Tractor Co. of Peoria, Ill.

T. AND D. COMMITTEE MEETING—More than 150 attended the E.E.I. transmission and distribution committee meeting at Pittsburgh's William Penn Hotel recently. At the head of the table are A. B. Campbell, E.E.I.; T. G. Hieronymus, Kansas City Power & Light Co., and E. V. Sayles, Commonwealth & Southern Corp.

Utility Engineers Seek Ultimate Loading Limits

E.E.I. transmission and distribution group assembles data on load carrying ability of cables and overhead conductors—Exchanges experiences with heavy war loads

What impairment is incurred in cables and conductors when heavy loads have to be carried for how long? was the major theme of the two-day sessions (February 11 and 12, 1943) of the E.E.I. transmission and distribution committee at Pittsburgh, attended by more than 150 utility engineers and manufacturers. Both fields were canvassed in discussions which extended those had at the recent A.I.E.E. sessions in New York.

Heating Suspended Conductors

Enumeration of the many variables involved in the heating of suspended conductors indicated the reasons for divergences in calculated values and operating quantities used by various utilities. The committee, headed by H. P. Seelye (Detroit Edison), will attempt to collate these values for early report. Incidentally, the Philadelphia and Pittsburgh utilities refuted the suggestion offered at the A.I.E.E. sessions that clamps might well be the bottlenecks in heavy current loading; data were offered showing that modern clamps and connectors run consistently cooler than the associated conductors.

In discussing the decline in cable dielectric strength with loading and time R. W. Atkinson (General Cable) suggested the use of shorter voltage jumps at more frequent intervals when making voltage breakdown tests. A nomogram for rapid calculation of permissible overload ratings was explained by Neil Walsh (Duquesne Light). J. A. Ten Brook (Philadelphia Electric) and W. B. Elmer (Westinghouse) commented that sheath troubles were still more to be feared than failure of insulation; short duration loads alter this, said R. J. Wiseman (Okonite), who presented a résumé of the recent A.I.E.E. cable conference. Several speakers reported that remelting of low-tin solders seems to alter the character of the lead content adversely; on this point L. F. Hickernell (Anaconda) suggested "resweetening" to offset the segregation of antimony and cadmium. Cathodic protection of sheaths was queried, but consensus seemed to be against its efficacy. Philadelphia Electric is experimenting with dyes to locate pernicious cable-oil leaks.

Design guides for H-frame structures were presented by W. C. Schmidt (Commonwealth & Southern). Lieut.-Col. J. J. Shoemaker recited the details of a 230-kv. wood-pole line (described in ELECTRICAL WORLD in the February 6 issue).

Reducing Fuse Blowouts

Discussion of reduction of fuse blowings and transformer burnouts, aimed at conserving manpower and tires, by G. H. Friedler (Rochester) brought forth evidence from Herbert L. Lowe (Ebasco) and Joseph B. Hodtum (Allis-Chalmers) in favor of using larger fuses as well as being sure they are on the line side of arrestors. A. C. Monteith (Westinghouse) said line protector tubes take less critical materials than ground wires and suggested that a 600-foot spacing should give good improvement in performance.

Discussion of the prospective regional set-up for administering the faltering program for facilitating the employment of excess materials evoked the reminder that evaluation of the technical work of the listed supplies would prove difficult and also the plea that competent men be obtained for these important posts.

One 500-kva., 13-kv. dry-type transformer was reported by M. W. Ghen (Duquesne Light) to be in service in conjunction with his report of the continuing development toward a 175C. line.

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December Peak Demands

Estimates of 1943 energy requirements made by the Class I electric utility systems in their December reports aggregate 214,859,965,000 kw.-hr. for the year, according to a report issued by the Federal Power Commission. Utility estimates of peak demands for December, 1943, are reported to amount to 38,025,099 kw. These figures represent decreases of some 2,230,000,000 kw.-hr. and 532,000 kw. from similar forecasts submitted by the utilities in November.

The commission reported that the electric energy requirements of the principal public utility systems of the country during December, 1942, totaled 17,170,836,000 kw.-hr., a gain of 13.8 percent over the same month in 1941.

New Bills Would Create Colorado Power Authority

Legislation before both houses empowers body to purchase utilities offered for sale — State rather than federal control sought on companies affected by "death sentence"

Most controversial issue ever faced by a Colorado Assembly is the introduction of legislation designed to create a State Power Authority. The bills were introduced by title during the first week of the present session, but details were not available until February 13.

Stems from "Death Sentence"

Introduced in both houses of the Colorado Legislature, the bills, duplicate in all respects, are sponsored by three Republican representatives and two Republican senators. Described as a "shotgun wedding" of privately owned public utilities to the state—a "romance" stemming from the "death sentence" provisions of the Holding Company Act—the measures contemplate purchase of eight Colorado electric concerns, due shortly to be "widowed" by divorce from their parent concerns.

In outline, the proposed legislation closely follows the pattern of municipal ownership plans, authorizing issuance of revenue bonds. Specifically, it sets up a nine-man directorate (each drawing $5,000 annually) empowered to purchase electric and gas utilities at "fair value." The act carries no condemnatory power, and only properties offered for sale can be bought.

Biggest company affected, of course, is Public Service Co. of Colorado, which supplies about 80 percent of the state's electricity and is a large distributor of natural gas in the Denver area. Public Service is a subsidiary of Cities Service Co. Other companies affected are Western Colorado Power Co., an Electric Bond & Share unit; Colorado Central Power Co., owned by Crescent Public Service Co.; Inland Utilities Co.; Southern Colorado Power Co.; Trinidad Gas & Electric Co., a Standard Gas & Electric Co. unit, and Highland Utilities Co., a former Byllesby property owned by Federal Light & Traction Co.

Electric utility executives of Colorado are reported to favor passage of the proposed legislation. The choice is between SEC taking control, with possible administration by REA, or state ownership under the projected plan. A Public Service Co. official comment was: "The gun's at our head. We believe that state control will be vastly more beneficial to the citizens of Colorado than federal control." Representative Dale Shotwell, one of the sponsors of the measure, added: "The legislation is designed to prevent Washington bureaucracy from getting its hands on Colorado's priceless power pool."

The legislation, scheduled for a second reading in House and Senate at an early date, climaxes eight years of effort on the part of Public Service Co. and the parent concern, Cities Service, to submit a plan satisfactory to the Securities and Exchange Commission. Final deadline for severance of the holding concern from its subsidiary was January 20, 1943.

Merchandising Barred

Provisions of the State Power Authority include: (1) No sales of merchandise (a $3,000,000 annual business with Public Service in normal times); (2) allocation of funds to counties in lieu of present taxes; (3) retention of personnel of purchased utility companies, in so far as possible, and the protection of their seniority rights (there are 2,500 Public Service employees); (4) amortization of purchase bonds—out of earnings—in 30 years.

Purchase of Public Service Co. of Colorado alone would represent a transaction of about $125,000,000 if the interests of stock and bond holders are to be protected.

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Los Angeles to Spend $4,500,000

Construction expenditures for the Los Angeles Bureau of Power and Light system will be held to the minimum in 1943 and probably will not exceed $4,500,000, the utility reports. In 1942 system additions and betterments totaled approximately $11,520,000.

Construction of the Harbor steam plant was delayed somewhat due to the war, but the first unit, originally scheduled for December, 1942, should be ready for a test run early in 1943.

Receiving station "D," with a present capacity of 150,000 kva., is expected to go into operation this month. It has been ready for operation for some months, but priority difficulties were experienced in securing necessary materials for high-voltage supply and 34.5-kv. distribution connections. This station will relieve overload conditions and improve voltage conditions in the West Los Angeles area and will allow for better utilization of the three Boulder transmission circuits by more even load distribution.

During 1942 generating facilities at Boulder power plant were increased by 82,500 kw. with the completion of Unit A-2 allotted to the city. A unit of the same capacity which had been leased from the Metropolitan Water District during the previous year was returned.

Electric energy produced for the Bureau of Power and Light system during 1942 was 2,381,000,000 kw.-hr., an increase of 16.2 percent over 1941. Present estimates indicate that more than 3,775,000,000 kw.-hr. will be produced in 1943, which would bring the total increase over 1941 to 83 percent.

MEETINGS

Previously Listed

Pennsylvania Electric Association — Hydraulic power committee, P.E.A. headquarters, Harrisburg, Pa., February 25. Paul M. Hess, chairman, Safe Harbor Water Power Corp.; electrical equipment committee, Roosevelt Hotel, Pittsburgh, Pa., February 25-26. A. N. Shealy, chairman, Pennsylvania Water & Power Co.

American Society for Testing Materials—Committee week and spring meeting. Hotel Statler Buffalo, N. Y., March 1-6. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

Southeastern Electric Exchange—Engineering and Operation Section, Henry Grady Hotel, Atlanta, Ga., March 25-26. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, Ga.

Electrochemical Society — Spring meeting, Hotel Roosevelt, Pittsburgh, Pa., April 7-10. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

American Institute of Electrical Engineers—Northeastern District, Wendell Hotel, Pittsfield, Mass., April 8-9; Southwestern District, Kansas City, Mo., April 28-30; National Technical Meeting, Cleveland, Ohio, June 21-25. H. H. Henline, national secretary, 33 W. 39th St., New York, N. Y.

Midwest Power Conference—Palmer House, Chicago, Ill. April 8-9. Stanton E. Winston, conference director, Illinois Institute of Technology, Chicago, Ill.

Missouri Association of Public Utilities—Annual business meeting, Elms Hotel, Excelsior Springs, Mo., April 16-17. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

National Electrical Manufacturers Association — Spring meeting, Palmer House, Chicago, Ill., April 20-23. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

North Central Electrical Industries—Annual all-industry conference, Radison Hotel, Minneapolis, Minn., April 26-27. Wm. A. Ritt, secretary-manager, Foshay Tower, Minneapolis, Minn.

American Society of Mechanical Engineers — Spring meeting, Hotel Black Hawk, Davenport, Iowa, April 26-28; semi-annual meeting, Hotel Biltmore, Los Angeles, Calif., June 14-16. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

Missouri Valley Electric Association—Annual engineering conference to be held in conjunction with meeting of 7th District American Institute of Electrical Engineers, Continental Hotel, Kansas City, Mo., April 28-30. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln, Neb.

Further Decline in Output Curve

Continued overcast weather and the pressure of war industries kept the output curve at a high level for the week ended February 13, but the curve showed some decline from the previous week. The amount of electrical energy distributed by the light and power industry totaled 3,939,708,000 kw.-hr. as compared to 3,960,000,000 kw.-hr. the week previous and 3,976,844,000 kw.-hr. for the week ended January 30, according to the Edison Electric Institute, source of the figures. The figure for the latest week represents a 15.1 percent increase in energy output over the corresponding week in 1942.

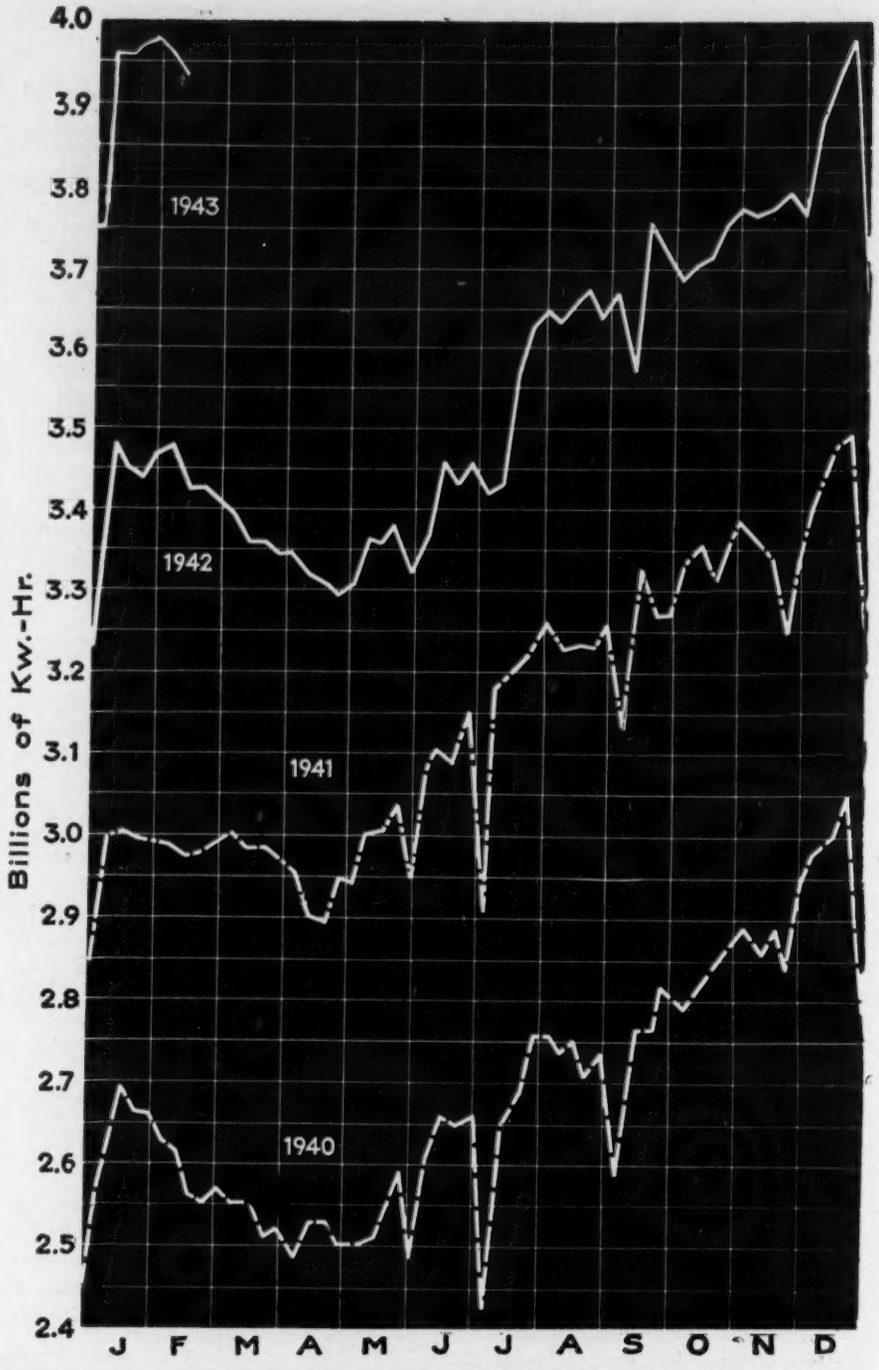
The Pacific Coast region increased its percentage of increase over the '42 figures from 29.9 percent for the week of February 6 to 32.2 percent for the week of February 13—by far the largest increase over last year registered by any of the other regions of the country. The Southern states remained in second place with a 19.3 percent gain. Most of the major geographic regions increased their percentage gains over 1942's week, compared to the week previous, with the exception of the West Central and Southern regions.

Weekly Output, Millions Kw.-Hr.

1943		1942		1941	
Feb. 13	3,940	Feb. 14	3,422	Feb. 15	2,976
Feb. 6	3,960	Feb. 7	3,475	Feb. 8	2,989
Jan. 30	3,977	Jan. 31	3,468	Feb. 1	2,994
Jan. 23	3,974	Jan. 24	3,440	Jan. 25	2,996
Jan. 16	3,952	Jan. 17	3,450	Jan. 18	3,013
Jan. 9	3,952	Jan. 10	3,472	Jan. 11	3,002
Jan. 2	3,780	Jan. 3	3,289	Jan. 4	2,816
1942		1941		1940	
Dec. 26	3,656	Dec. 27	3,234	Dec. 28	2,757
Dec. 19	3,976	Dec. 20	3,495	Dec. 21	3,052
Dec. 12	3,937	Dec. 13	3,476	Dec. 14	3,003

Percent Change from Previous Year

	Week Ending		
	Feb. 13	Feb. 6	Jan. 30
New England	+ 6.0	+ 3.1	+ 3.6
Mid-Atlantic	+ 8.6	+ 5.1	+ 7.7
Central Industrial	+12.4	+11.8	+12.2
West Central	+13.0	+15.0	+15.6
Southern States	+19.3	+20.4	+20.1
Rocky Mountain	+14.2	+12.3	+13.8
Pacific Coast	+32.2	+29.9	+29.6
Total United States	+15.1	+14.0	+14.7



Utilities Urged to Comply on Components

Utilities have been urged to comply as closely as possible with deadlines for ordering critical common components established by WPB Production Vice-Chairman Charles E. Wilson.

In an administrative letter emphasizing the necessity for prompt ordering, Director J. A. Krug, of the Office of War Utilities, warned that no orders should be placed for components to be used in projects not yet definitely approved even though the components may be needed this year.

Components for maintenance and repair, however, should be ordered as soon as possible. Only those maintenance orders should be placed which are to fill definitely forseeable needs.

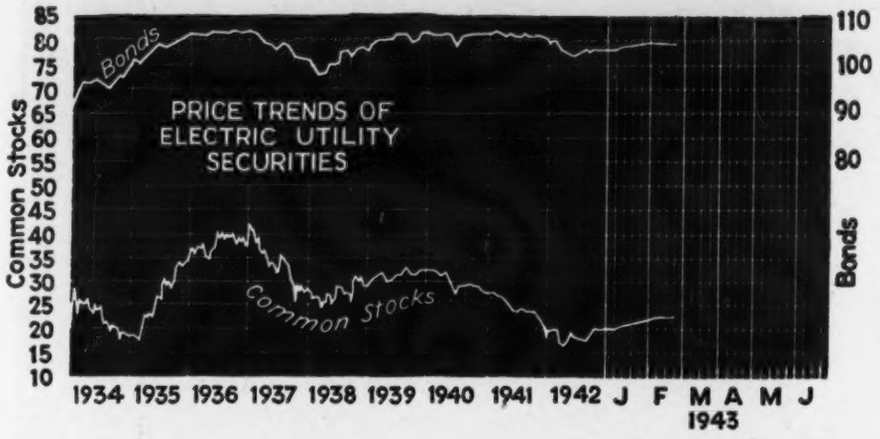
Orders received after the deadlines will be fitted into production schedules as far as possible on the basis of their urgency.

Krug's letter was a follow-up of an order issued last month by Wilson, who asked that orders of critical components or of end items containing such components which are to be delivered by June 30 be placed by February 6. Orders for components for delivery between June 30 and December 31 must be placed by March 1. The move was aimed at allowing Wilson the greatest possible freedom in boosting production of these critical items.

Common components on the critical list include:

Diesel and gasoline engines, engine accessories, crankshafts, woodworking tools, blowers and fans, compressors and vacuum pumps, conveying equipment, industrial pumps, turbo blowers and exhausters, welding rods and electrodes, electric motors, starters and generators, pressure vessels, jewel bearings, central steam heating and steam-generating boilers, industrial auxiliary turbines, industrial main propulsion turbines, hydraulic parts, optical lenses, carbon dioxide extinguishers, ball and roller bearings and hand tools.

Utility Stocks Move Upward; Bonds Firm



Public utilities were in the foreground of the upward swing in securities prices this week. "Electrical World" stock index advanced from 22.4 the preceding week to 22.8, the highest point since October, 1941. Last year, 19.4. Bonds remained unchanged

Niagara Hudson Hearing Postponed

Dissolution Plan Up Before SEC March 2

Plans for the liquidation of the Niagara Hudson Power Corp. and corporate simplification of its system, under Section 11 (b) (2) of the Holding Company Act, are still in process of being worked out, it was learned recently, with the postponement of scheduled hearings on the proposals until March 2 by the Securities and Exchange Commission. The plans, to have been filed late in January, were put off February 9 by the commission and now go over another month.

The proposals under discussion call for the merger of all the electric and gas operating units of the holding company into the Niagara Falls Power Co., a subsidiary of Buffalo, Niagara & Eastern Power; a consolidation of the remaining subsidiaries and assets into a newly formed company, and the distribution of the assets resulting from these consolidations to holders of Niagara Hudson Power Corp. securities. The corporate readjustment will result in a redistribution of voting power, as a result of which United Corp., which now owns 23 percent of the stock of Niagara Hudson Power Corp., would cease to be the parent company of the Niagara Hudson system.

Operating units which would be merged into Niagara Falls Power Co. would include New York Power & Light Corp., Central New York Power Corp., Buffalo Niagara Electric Corp., Niagara Lockport & Ontario Power Co. and Lockport & Newfane Power & Water Supply Co. Niagara Falls Power Co., in turn, would be consolidated with Buffalo, Niagara & Eastern Power Corp., with Niagara Falls emerging as the surviving company. Combined capital assets of the consolidated concern would be in the neighborhood of $500,000,000.

Other subsidiaries to be consolidated in the newly formed company would comprise Hudson Valley Fuel Co., Northern Development Corp., Union Bag & Power Corp., St. Lawrence Power Co., Ltd., Oswego Canal Co. and various security investments of Niagara Hudson Power Corp. These properties have a fixed capital of about $60,000,000, while the securities have a value of about $8,000,000.

The recent request for a continuation of the hearing until the March 2 date came from Harry G. Slater, counsel for the public utilities division of the SEC, who explained that both sides had agreed to the proposal.

Utility Reports

	Net Income 1942	1941
*Boston Edison	$5,688,106	$6,006,126
*Central Arizona Lt. & Pwr.	†804,824	664,399
*Columbia Gas & Electric and subs	8,773,669	10,441,266
*Detroit Edison and subs.	7,837,720	12,443,156
*Eastern Minnesota Power	22,510	39,247
*Florida Power & Light	†1,867,891	2,498,778
‡Iowa Elec. Lt. & Pwr.	710,630	815,281
*Kansas Gas & Electric	†1,499,640	1,404,230
*Mississippi Power & Light	†656,531	479,005
*Montana-Dakota Utilities	1,542,044	1,266,026
*Texas Electric Service	†1,685,968	1,222,659
*Texas Power & Light	†1,868,083	1,704,779
*United Corp. and subs.	3,553,145	6,811,213
*Wisconsin Hydro-Electric	63,907	99,875

* Twelve months ended December 31.
‡ Twelve months ended November 30.
† Preliminary.

Order Reargument on Jersey Central

Supreme Court also upholds Oklahoma on power line permit

The Supreme Court of the United States last week handed down two orders affecting utility companies.

In the first the court ordered a reargument of the case of the Jersey Central Power & Light Co. against the Federal Power Commission. The utility is contesting a ruling that it is subject to FPC jurisdiction. Jersey Central claims to operate entirely within one state, but sells current to New Jersey Power & Light Co., which concededly transmits it across a state line. Argument arose over the question that the acquisition of Jersey Central stock by New Jersey Power & Light was without FPC authorization and therefore a violation of the Federal Power Act. The lower courts have held that Jersey Central is subject to the Federal Power Commission jurisdiction as a result of the connection.

In the second case the Supreme Court approved the action of the state of Oklahoma in permitting Oklahoma Gas & Electric Co. to construct power lines along a highway which crossed Indian lands. The government had given the state permission to build the highway and the state permitted the construction of the power line without consulting the government. It was the government's contention that the permission to build the highway was not so broad as to include the power line. Justice Jackson, however, who wrote the majority opinion, held that Congress intended to give wide discretion to local authorities and that Oklahoma's grant to the utility was in order. Justices Black and Douglas dissented.

"This is not such a transmission line as might endanger highway travel or abutting owners with no compensating advantage," the court held. "It is a rural service line, and to bring electric energy into the countryside is quite as essential to modern life as many other uses of the highway . . ."

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Utility-Jacksonville Power Line Completed

The 66,000-volt line ordered by the Federal Power Commission to be built by the Florida Power & Light Co. from Baldwin to the city limits of Jacksonville to provide an emergency source of power to the city (ELECTRICAL WORLD, May 30, 1942, page 132) has been completed.

HOW TO SAVE COPPER BY THE TON

This "slide rule" gives you an —and surprising—figures on h copper requirements shrink as y move a 1000-kva, 4160/480-v unit substation nearer to the l center. One of these rules can be o tained free by mailing the coupon

INSTALL UNIT SUBSTATIONS
AT THE CENTER OF THE LOAD AREA
See How You SAVE Cable Copper
The closer to the load . .
. . the more copper you save

PUT UNIT SUBS AT THE LOAD CENTER TO SHORTEN SECONDARY RUNS

Compact, load-center unit substations *installed right at the load center* save tons and tons of copper by replacing long, secondary runs with small-size primary cables.

These "packaged" unit substations are so safe and compact that they can be placed right in working areas, in relatively valueless space along column centers, on sub-balconies, or over washrooms. Because of their location adaptability, you don't have to worry about last-minute rearrangements of machinery. "They go anywhere the load can."

Standard Factory-assembled Units

You don't have to spend weeks writing bulky specifications either. You can select complete, integrated substations for your needs from a line of *standard factory-assembled units*. They arrive all ready to be set in place and connected—at the spot where they take the least copper and do the best job.

For further information on load-center unit substations, call or write the G-E office nearest you. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

Standard, "packaged" load-center unit substations include Pyranol transformers, and metal-enclosed drawout air-breaker equipments for control and protection of the low-voltage feeders. The drawout breakers can be readily withdrawn for quick, easy inspection, and can be replaced by a spare in only a few minutes.

General Electric, Section A 302-17
Schenectady, N. Y.
Please send me those checked:

- Load-center "slide rule"—GES-3043
- "Five Ways to Save Copper"—GED-1011
- "Quickly Installed Electric Power Systems"—GED-1006

Name.....
Company.....
Address.....
City.....State.....

HOW DESIGN... CONSTRUCT OPERATE MAINTAIN

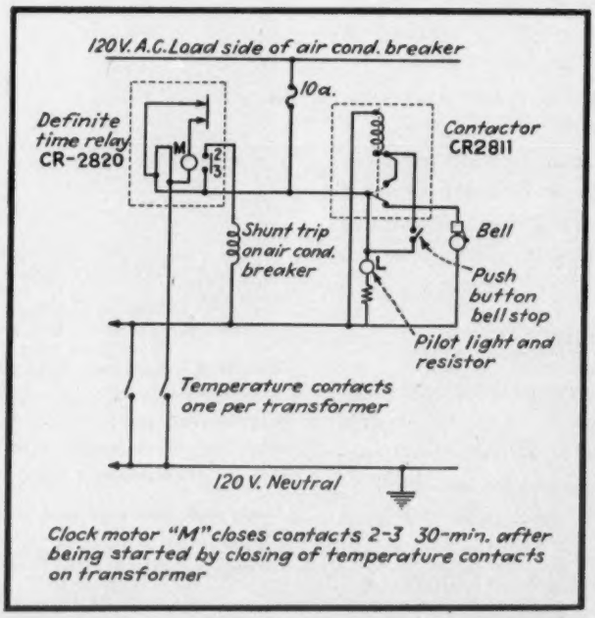
Temperature Relay Cuts Power Load

By A. G. JOHNSON
Nebraska Power Company, Omaha

Temporary relief may be afforded to transformers in war plants and on utility systems that are nearing their overload limits by some modification of the excess-temperature alarm system developed and used by the Nebraska Power Company to relieve network transformers overburdened by air-conditioning load during summer peaks. The accompanying circuit shows the scheme in its essential elements.

The scheme is used in Omaha, where customers have air-conditioning loads of more than 100 kva., served from the secondary network system. Each transformer is equipped with a contact-making thermometer connected to a bell and indicating light in the building engineer's office and through a time-delay relay to the shunt-trip on the breaker for the air-conditioning load. In case one of the transformers should overheat the bell and indicating light will operate. The engineer in charge notifies the company's load dispatcher and reduces his load to a predetermined value. However, if he fails to cut load in 30 minutes or the contact-making thermometer does not open the compressor load is automatically dumped.

Noteworthy, particularly now when transformer capacity is at a premium, is the fact that in at least two instances in Omaha use of this system made it possible to serve certain commercial loads with one less than the number of transformers previously indicated by the summer peak.


120 V. A.C. Load side of air cond. breaker
10a.
Definite time relay CR-2820
M
2
3
Contactor CR2811
Shunt trip on air cond. breaker
Bell
Push button bell stop
Pilot light and resistor
Temperature contacts one per transformer
120 V. Neutral
Clock motor "M" closes contacts 2-3 30-min. after being started by closing of temperature contacts on transformer

EXCESS temperature alarm system warns of mounting transformer temperature; cuts non-essential load if not heeded

•

Safeguarding Water in Electrical Fires

It is a general belief, the Associated Factory Mutual Fire Insurance Companies, Boston, state in a recent bulletin, that to use water in fighting a fire in live electrical apparatus is extremely hazardous, but under certain conditions, and particularly where voltages are low, such use is not dangerous. A solid stream of water used in live equipment will in some cases carry currents which would be dangerous to the holder of the nozzle. As little as 0.1 amp. may be harmful to some individuals, and some authorities hold that 0.05 amp. is about the smallest amount that can result fatally. Persons with moist skins are in greater peril than others.

Minimum Safe Distances for Water Streams (Solid)

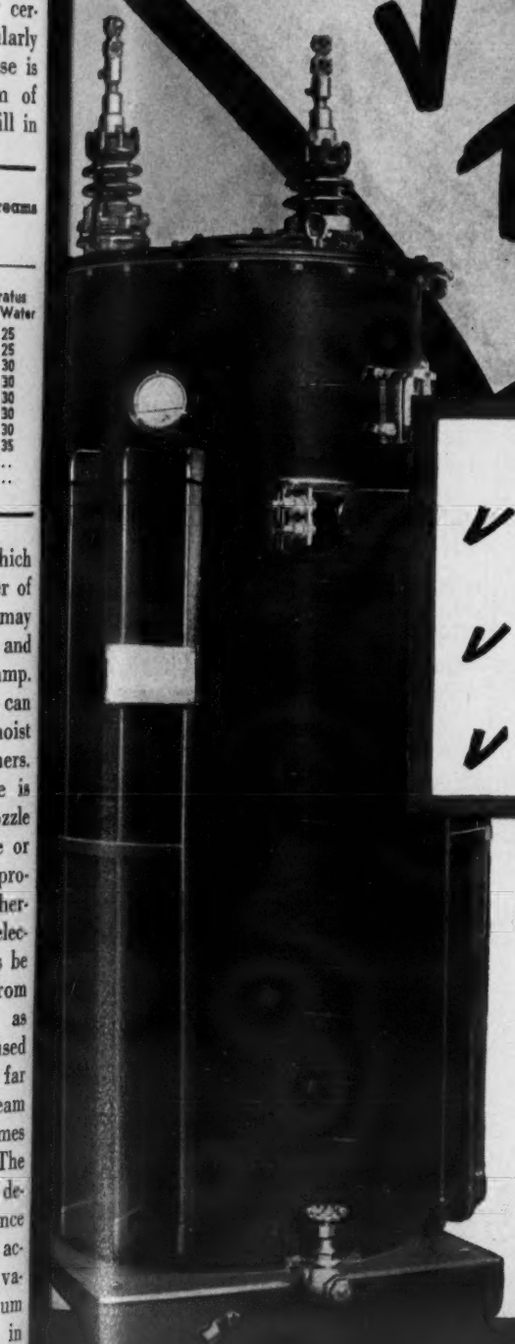
Voltage to Ground	Feet from Live Apparatus Fresh Water	Salt Water
1,100	6	25
2,200	11	25
3,300	15	30
5,000	18	30
6,600	19	30
11,000	20	30
22,000	25	30
33,000	30	35
60,000	70	....
150,000	80	....

For voltages up to 600 there is usually no danger unless the nozzle is brought very close to the line or device. If in doubt the safest procedure is to shut off the current wherever possible before fighting an electrical fire, but this cannot always be done. A stream from a hose or from a water-type extinguisher, such as pump tank or soda-acid, can be used safely if the operator stands far enough away so that the stream breaks into a spray before it comes in contact with the equipment. The safe distance for solid streams depends upon the voltage and distance from nozzle to apparatus. The accompanying table, compiled from various sources, gives the minimum safe distances for streams 1½ in. in

Add Them to Your Check List of Safety Measures

✓ Fire-alarm Systems
✓ Fire Walls
✓ Sprinkler Systems
✓ Pyranol Transformers

...Because Pyranol Cannot Burn



FROM THAT ONE FACT SPRING MANY BENEFITS:

✓ YOU CAN INSTALL THEM INDOORS *SAFELY:* No Pyranol transformer has ever burned or contributed to a fire. Even if heat from a surrounding blaze ruptures the tank, the fire hazard will not be increased.

✓ VAULTLESS INSTALLATIONS ARE POSSIBLE: You can install them indoors or outdoors —in the basement, on the factory floor, on overhead beams, or on the roof. Such flexibility assures you major savings in time, floor space, and construction materials.

✓ PRIMARY POWER CAN BE RIGHT AT THE LOAD: Voltage regulation is improved, line losses are lowered, copper is saved—often up to 30,000 lb in large industrial installations.

AND BECAUSE THEY ARE *LIQUID-FILLED* THEY HAVE:

✓ — —A HIGH, *LASTING* DIELECTRIC STRENGTH—an important safeguard against damage from voltage surges caused by lightning and switching

✓ — —PRESSURE-TIGHT TANKS, which protect vital parts from dust, dirt, and sabotage

✓ — —A HEAT-STORAGE CAPACITY that is ideal for emergency overloads

PYRANOL* transformers fit naturally into your wartime campaigns for (1) safety, (2) stepped-up production, and (3) conservation of critical materials.

The absence of fire hazard will help you with campaign No. 1. A reliable power supply, easily installed *where you want it,* is an important consideration for No. 2. Fireproof vaults being unnecessary, vital construction materials are saved. Since Pyranol transformers can be located at the load center, the runs of secondary copper are greatly reduced. These are important factors in helping you with point No. 3.

Since the introduction of Pyranol, in 1932, more than 4,000,000 kva of new transformers have been built using this type of cooling and insulating liquid. Hundreds of users are finding that Pyranol transformers assure the lowest total installed cost commensurate with the highest degree of safety.

Ask your G-E representative for the complete story, or write for Bulletin GEA-2048D. *General Electric Company, Schenectady, N. Y.*

**Pyranol is the G-E trade name for askarel.*

The Navy "E" for Excellence has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

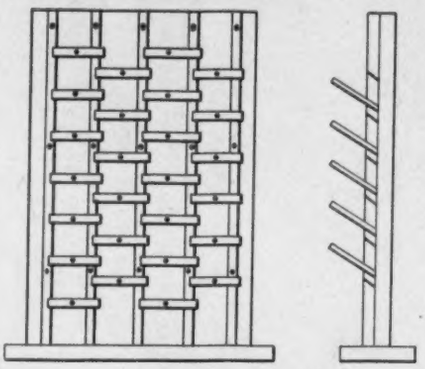
GENERAL ELECTRIC

diameter or smaller. Salt water requires greater distances.

Certain types of approved spray nozzles—Poweron, Grinnel, Sprayco—can safely be used on live electrical apparatus in emergencies. Tests with "Poweron" nozzles showed that no dangerous current was conducted when used at a minimum distance of 10 ft. at any pressure above 20 psi. on any voltage up to 250 kv. (At a recent conference in Boston under the auspices of the Doble Engineering Company it was brought out in the discussion that water from an American La France fog nozzle had been safely used on a 220-kv. bus at a distance of 14 ft., the range being about 28 ft. at 60 psi. At 90 psi. two men are required to hold the nozzle. The minimum safe pressure was given as 35 to 40 psi.—Ed. Note.)

Extinguishers of the vaporizing liquid (carbon tetrachloride), carbon dioxide and dry-chemical gas-pressure types discharge non-conducting streams and can safely be used on live equipment where it is not feasible to turn off the current in order to protect operators in case of accidental contact with any of the electrical apparatus.

Proper Oil Quantity for Register Motors



FRAME holds demand register motors in position for correct amount of oil

The proper amount of oil in an M21 demand register motor is 1.8cc. This amount is that which the motor will hold when inclined at an angle of 30 deg. from vertical. A simple device by which a considerable number of rotors or of completely assembled motors can be held in the required position is in use in the meter laboratory of the Philadelphia Electric Company.

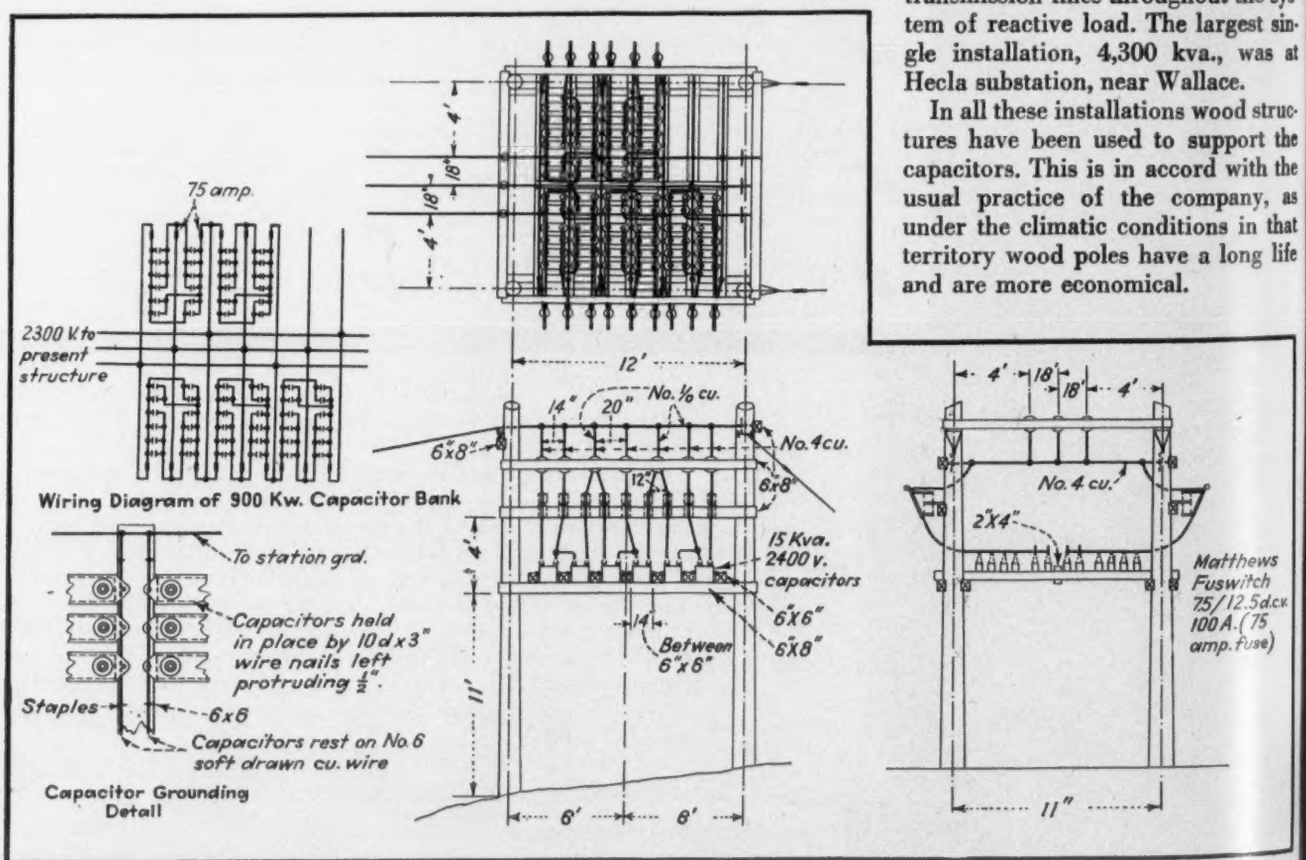
As shown in the sketch, five ½-in. angles are fastened to the face of a vertical panel standing in a shallow trough into which the oil dripping out of the motors is drained. Slots of the proper inclination are cut in the sides of the angles so that flat crosspieces drilled in the center to hold the rotor shafts may be inserted. The ears of an assembled motor will also enter a pair of slots. To prevent oil from dripping on rotors or motors below, each position includes a small catching trough as shown.

•

Capacitors Installed at Substations

The Washington Water Power Company has recently completed the installation of a total of 20,000 kva. in static condensers at various substations in Spokane, Wash., and Wallace, Idaho. The last installation was finished November 18. There are seven substations so equipped in each city, the capacitors in Spokane totaling 10,300 kva. and those in Wallace 9,700 kva. In all cases they are connected to the 2,300-volt substation buses. The capacitors were added primarily to relieve the generators and transmission lines throughout the system of reactive load. The largest single installation, 4,300 kva., was at Hecla substation, near Wallace.

In all these installations wood structures have been used to support the capacitors. This is in accord with the usual practice of the company, as under the climatic conditions in that territory wood poles have a long life and are more economical.



TYPICAL installation of capacitors at substations on Washington Power Co. system

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NEW, TIME-SAVING CATALOGS

on Small Pyranol Capacitors for Built-in Applications

THESE publications make it easy for you to select Pyranol* capacitors for applications such as electronic devices, communications equipment, control, motors, and transformers.

This technical information is up to the minute, easy to use. Covers all the standard types and sizes generally required—all those that have been found most desirable with respect to ratings and dimensions.

You'll find it's easy to design with G-E capacitors, because: (1) Pyranol, the treating material, makes these units small and compact—often you can reduce the size of your equipment and save critical material; (2) many of the ratings are available in cylindrical, oval, or rectangular cases; and (3) they can be operated in any position.

Get your copies of these comprehensive, time-saving publications.

*Pyranol is the G-E trade name for askarel—a synthetic, noninflammable liquid.

VALUABLE FOR ENGINEERING, DRAFTING, OR PURCHASING DEPARTMENTS

- ★ More than 350 standard ratings to choose from
- ★ Easy-to-read, easy-to-use tables and diagrams
- ★ Large photographs of representative types
- ★ Handy thumb index for quick reference

General Electric Company, Section E 407–49
Schenectady, N. Y.

Please send me complete information on small Pyranol capacitors for built-in applications.

☐ For D-c Applications (GEA-2621A)
☐ For A-c Applications (GEA-2027B)

Name.....
Company.....
Address.....
City..... State.....

5700

GENERAL ELECTRIC

While the installation of static condensers on the buses is not new in conception, it is still common practice to locate them in small groups of 90 to 180 kva. scattered over the distribution system. In the case of the Washington Water Power Company, to have followed this practice would have meant 100 to 200 small installations.

In the opinion of the company's engineers, it would be more economical to concentrate them in a few groups of large capacity, with little apparent difference in operation as regards the system as a whole. This decision was further influenced by the fact that in Wallace the load is comprised of a comparatively few large mining operations and there were, in fact, few places available, and a wider distribution of the capacitor equipment would have been impracticable.

The method of mounting the static condensers and the design of the structure is shown in the illustration on page 74. This is the Gold Hunter substation, with 900 kva. in capacitors installed. This may be considered a typical installation, except for the fact that the contour of the terrain immediately back of the substation necessitated placing the capacitor structure a few feet away from the substation bus.

Three types of capacitors were employed—General Electric, Westinghouse and Cornell-Dubilier—all 15 kva., 2,400 volts. They are supported on 6x6-in. fir timbers, which in turn are carried on 6x8-in. timbers between the cedar poles.

•

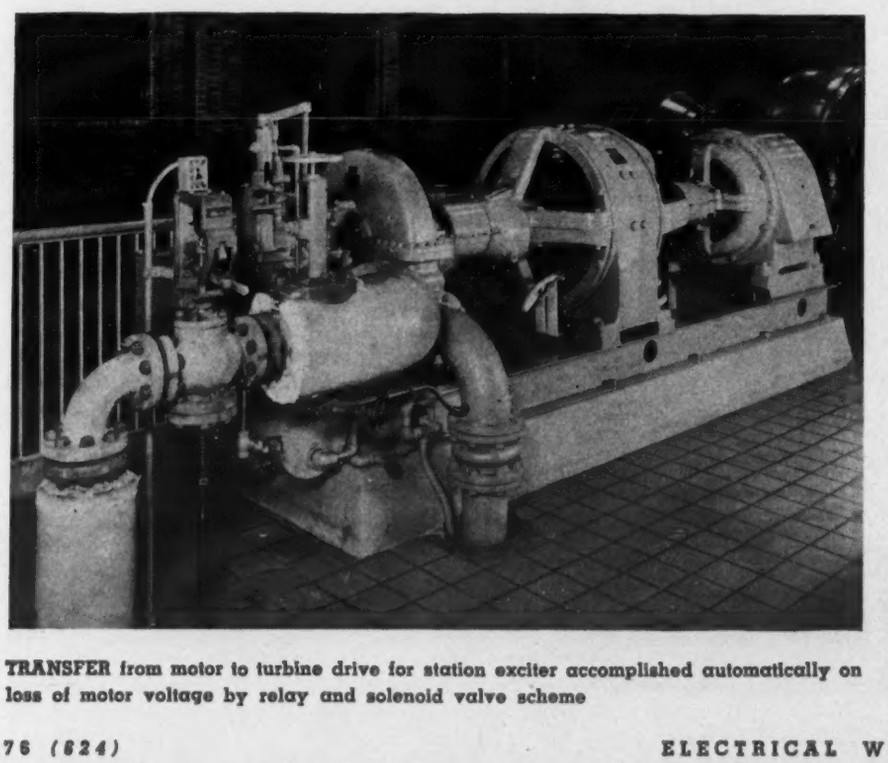
Automatic Change-Over for Exciter Drive

Transfer from motor to turbine drive on the 125-kw. exciter supplying the 125-volt, d.c. station exciter bus at the generating station, City Utilities, Fort Wayne, Ind., is accomplished automatically on drop in voltage in the 2,300-volt circuit supplying the normal induction motor drive. Serious dips in voltage trip a relay opening a solenoid valve in the 375-lb. steam line to the turbine, throwing it on the line to drive the exciter. Both electrical and mechanical considerations influenced the adoption of the dual drive scheme used.

At the time this installation was made this plant was without interconnections (an interconnection is now in service). Serious voltage dips in the 2,300-volt a.c. circuit supplying the 190-hp., 1,200-r.p.m. induction motor could, therefore, cause loss in speed sufficient to depress exciter voltage. Generator output voltage would, in this event, fall off, further accentuating the drop in motor voltage and eventually leading to an outage. Automatic transfer to turbine drive on serious voltage dips forestalls this cycle of events. A transformer in the lead of the motor supplies voltage for operating the solenoid valve.

Second reason for using the solenoid valve in the steam line to the turbine is to reduce steam losses. The 190-hp., 1,200-r.p.m. single-stage turbine exhausts to atmosphere and it was found impossible to close the turbine governor valve "bottle-tight." Losses of steam at 385 lb. pressure and 305 deg. F. superheat were sufficient to require a back-up valve.

While this dual-drive exciter nominally supplies the exciter bus for the 7,500- and 15,000-kw. station turbines a second steam-driven stand-by exciter is provided in the station for emergency use.



TRANSFER from motor to turbine drive for station exciter accomplished automatically on loss of motor voltage by relay and solenoid valve scheme

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Primary Cable Along Rear Lot Lines

By **HENRY C. MAJOR**
Commissioner of Utilities,
Rockville Center, N. Y.

Originally only secondary lines were run along the rear property lines to serve the block of customers inconspicuously. More recently these services have been rendered by means of two-conductor primary cable hung on a messenger wire in order to meet the growing residential loads.

Take-off from an avenue run of overhead open wire primary is by means of two-conductor No. 4 rubber-insulated, lead-sheathed cable carried in galvanized pipe from the cutouts and fuses which protect the transformers, of which there are never more than two in the block. If there are two of them a Y-splice is made at the first to extend to the second. The galvanized duct is extended 10 ft. up the street pole and the first pole along the rear lot lines, the pipe being laid usually along the frontage party line which is aligned with the rears of lots on the right angle streets.

No cutouts or fuses are used at the transformers and there is therefore little occasion to cross the customers' property for maintenance. In fact, the construction is practically trouble-free. The conductors are all insulated and no terminals are exposed or accessible. Effort is made to carry on inspections and changes in the winter, when there are no gardens to be trampled. Incidentally, ordinary stevedore hand trucks have proved to be a good means of bringing a transformer to the base of the pole on which it is to be mounted.

Here's More Proof

that the RIGHT instrument makes trouble shooting a CINCH

READ how the RIGHT instrument helped Mr. A. Rusfeldt, electrician at the Michigan Alkali Quarry, save valuable production time:

"A surge grounded a coil in our crusher motor. There were no visible smoke marks or splashes to show where to look for it. We started to use the old-fashioned test of opening connections and ringing with a magneto. Then I realized that this was just the job for our G-E AK-1 hook-on instrument.

"With a resistance connected in series with the winding, we ran current (110 volts, a-c) through the winding to ground. We then traced out the grounded bank of coils by clamping on over the jumpers. On the third try we found it."

Green Hands Make It Even More Necessary to Have the RIGHT Instruments

An experienced man like Mr. Rusfeldt could have found the trouble without the AK-1 (described below). But it saved him time—valuable crusher production time.

How much more important to have the RIGHT instruments for your inexperienced men! They don't know the short cuts and ingenious ways of testing electric equipment. It will pay you to be *sure* you have all the instruments needed for your maintenance work.

Mr. Rusfeldt is using his AK-1 to locate the damaged coil after tracing the grounded-coil bank.

HERE'S HOW WE CAN HELP YOU

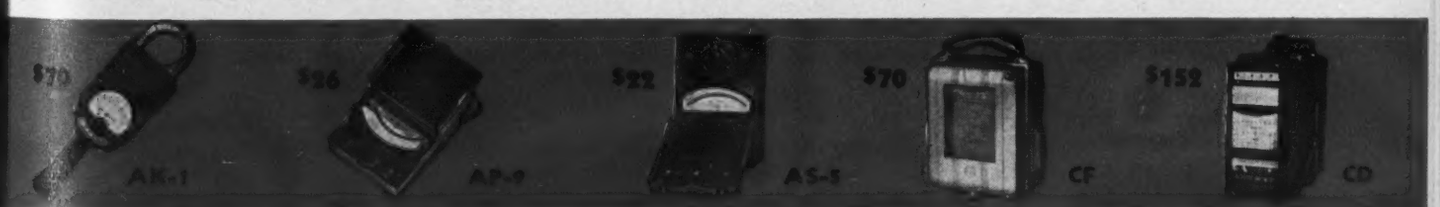
1. *If you need* a testing instrument, the five shown below will do 90 per cent of all testing jobs (prices are for estimating only). Bulletins listed give complete data.

2. *If these do not answer,* tell us what you need: The chances are we can send you a bulletin describing just the instrument for your purpose.

3. *If you'd like help* in selecting an instrument for a specific job, call the nearest G-E office. One of our instrument men will be glad to assist you.

General Electric Company, Schenectady, N. Y.

WHICH OF THESE TESTING INSTRUMENTS DO YOU LACK?



A-C HOOK-ON VOLT-AMMETER. The handiest of instruments for quick load checks—no cutting conductors or interrupting service. Measures volts also. Bulletin GEA-2950.

MEDIUM-SIZE PORTABLE, A-C (AND DP-9, D-C). Accurate within ¾ of one per cent. Very portable—size only 2½ by 6½ by 4¾ inches. Price covers a 5-amp ammeter. Bulletin GEA-1784.

POCKET-SIZE PORTABLE, A-C (AND DS-5, D-C). Accurate within one per cent. Slips easily into a coat pocket—size 2 by 3½ by 5½ inches. Price covers a 5-amp ammeter. Bulletin GEA-1784.

INKLESS RECORDER, PORTABLE. An inexpensive instrument. Inkless—no pen to start and no ink to spill. Price covers a 5/10-amp ammeter. Bulletin GEA-3187.

INK RECORDER, PORTABLE AND SWITCHBOARD. Ideal for use where a high degree of accuracy is very important. Price covers a 5-amp portable ammeter. Bulletin GEA-1061.

GENERAL ELECTRIC

502-41-8300

HOW ONE COMPANY CO-OPERATES* IN ERADICATION OF DUTCH ELM DISEASE

New England Power System, together with other utility companies, has agreed to cooperate with federal and state agencies in a strenuous effort to eradicate Dutch Elm Disease. The assistance of N.E.P. Co. consists of observing the following practice which has been included as part of its Overhead Construction Standards.

Standard Practice

1. In the process of tree trimming and clearing of rights-of-way all elm trees or members thereof, having a diameter of 2 in. or more, should be burned immediately after cutting, during the period between May 1 and November 1. Between November 1 and May 1 immediate burning is not necessary, but all cuttings should be burned prior to May 1.

2. In soliciting private rights-of-way or the removal of trees, the property owner should be advised of this practice and the necessary arrangements made with him for the burning of the elm wood removed from his property.

3. All contracts that are hereafter placed for the clearing of rights-of-way or for the removal or trimming of trees on streets or highways should carry a clause covering the burning of all elm wood cuttings in accordance with the instructions given in paragraph 1.

4. Whenever any property owner will not agree to the destruction of elm wood removed from his property, or when a local fire warden will not issue a permit for the burning of such elm wood cuttings, full details of the situation should be reported to:

New Hampshire-Vermont-Massachusetts
T. M. Cannon, Chief Scientific Aid
U. S. Department of Agriculture
Bureau of Entomology and Plant Quarantine
Northampton, Mass.

Rhode Island-Connecticut
M. P. Zappe
Deputy State Entomologist
Connecticut Agricultural Experiment Station,
New Haven, Conn.

5. If, when working in elm trees, indications of infection are observed, information concerning the location of tree or trees with sample twigs (lead pencil size) should be forwarded to Mr. Cannon.

6. When it is found that infected elm trees have been trimmed saws and/or pruners used should be dipped in a solution of 95 percent alcohol before using again.

7. Guys should not be attached to elm trees or, if there is no alternative, the owner should be told about the disease at the time of obtaining guying rights as a precaution against his blaming the presence of the guy in case the tree should become infected later.

Indications of the Disease

The Dutch Elm Disease, which destroys elm trees, once they become infected, is known to be generally established in the area within a hundred mile radius of the port of New York. Diseased trees have been found beyond this area in New York state near the Vermont line, in Connecticut within 5 miles of the Rhode Island line and in western Massachusetts.

The disease was brought into this country in logs imported from Europe a number of years ago. It is caused by a fungus the reproductive parts of which are confined to the interior of the tree and are therefore seldom wind disseminated.

The disease is spread by a very small elm bark beetle which bores through and burrows under the bark. When the beetle emerges from a diseased tree spores of the fungus are attached to its body and are transplanted when it bores into another tree.

Propagation of the beetle occurs in late spring, summer and early fall in devitalized wood such as broken branches and cuttings which are left on the ground.

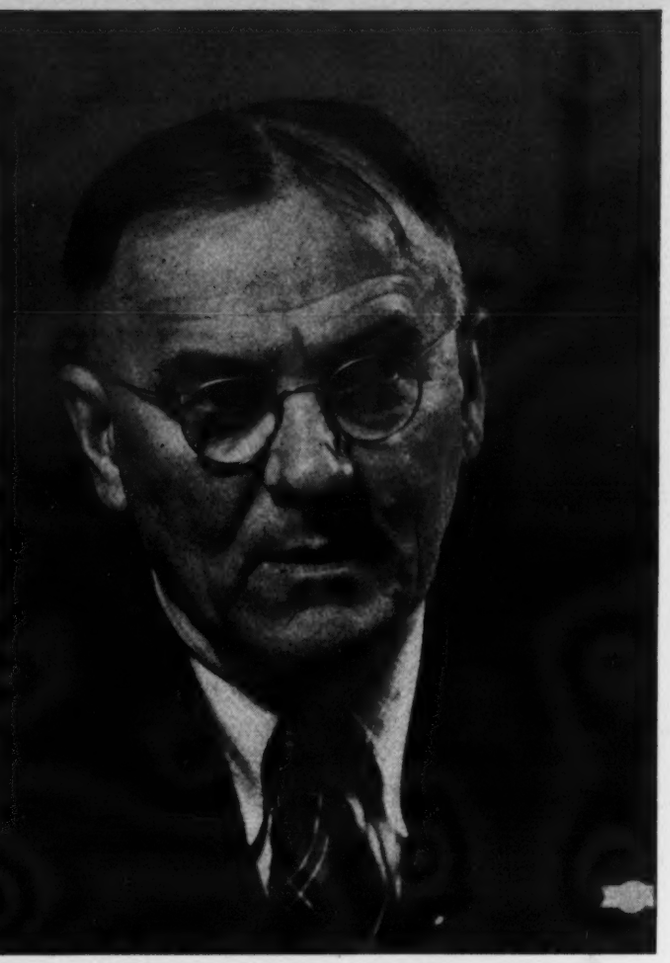
There is no known cure for the disease, therefore eradication consists of the complete destruction, by burning, of infected trees and destruction, by the same means, of all wood which might offer a breeding place for the beetles.

Indications of the presence of the disease are wilting of the leaves, which is followed by discoloration, shrivelling and early falling off.

When infected branches are cut crosswise the wood just under the bark is brownish in color, either in a complete ring or in spots.

*Adapted from a book of standards of New England Power System. This co-operative practice follows the recommendations of Dr. Malcolm McKenzie, Massachusetts State College, Amherst, and T. M. Cannon, U. S. Department of Agriculture, Northampton, Mass.

"We could lose this War between 5 p.m. and 7 a.m."



JOHN BLAZEK, the author of this remarkable statement, is the production manager of a war-material plant in a midwestern city.

I'M no pessimist. But I'm telling you the hours between sunset and sunrise can be the most critical hours of this war. Not on the battlefronts, but in the factories and shops where they're making the things our boys must have to win the final victory.

My factory has been working on important war contracts. Daytime production was as good as could be expected. But night production was 40% behind schedule. The employees worked just as hard. They seemed more tired than the day crew. But they weren't making the grade.

I knew a dozen things might be wrong, but I had an idea one trouble might be the lighting. So I called in a lighting man and put it up to him.

"He made a careful study. Then he showed me what *was* wrong with the lighting, particularly as it affected the night workers. I was willing to try *anything* that might help, so we made the changes he recommended. Today, under the new improved lighting, our night shift workers are running neck and neck with the rest.

"I don't know how many other plants have been having this same trouble. But if production generally is lagging behind on the night shifts—those hours between 5:00 P. M. and 7:00 A. M.—*we could lose this war.* Unless we do something about it right away.

"As one production man to another, all I know is, if you're having night shift trouble, one thing you'd better check up on is your lighting. It may help you. It certainly helped us."

AS of mid-February the "Bomber Builders" have added a total of more than 40,000,000 man-hours to annual war production, by improving the lighting in plants like John Blazek's. One or more of your men is undoubtedly contributing. The lighting industry can be proud of its war work—the only question is "Are we doing enough fast enough?" General Electric, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Induction Heating Conserves Tin

By G. E. STOLTZ
Engineering Manager, Metal Working Section, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

High-frequency induction heating has been applied to steel sheet for a relatively new operation known as "flowing of tin." This is a new method of fusing tin and was designed as the final step in making electrolytic tin plate. The process uses only one-third as much tin (30 millionths of an inch on each side of the strip) as the system of dipping steel sheets into tanks of molten tin.

The frequency at which the required current can be induced in the strip without using abnormally high voltages depends upon the thickness of the sheet. Since tinplate usually is 0.008 to 0.011 in. thick, a frequency approximately 200,000 cycles per second is most practical for this thickness of sheet.

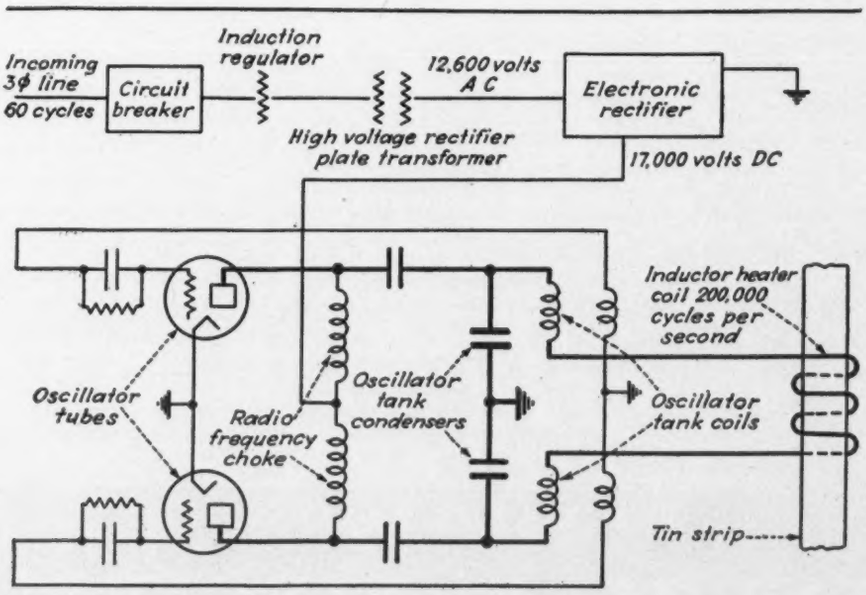
Heat is applied by an inductor heater coil which is rectangular in form and wound as close to the strip as mechanically possible. The coil acts as the primary of a transformer, while the strip itself constitutes a single turn secondary. The induced current flows across the strip paralleling the turns of the inductor heater coil. The heat generated in the strip is due to the resistance of the strip and the current flowing through it.

Power for heating is supplied by vacuum tube oscillators. Sixty-cycle alternating current is rectified to direct current by a high-voltage rectifier plate transformer and an electronic rectifier. The d.c. power is then fed to the oscillator tubes, where it is converted to 200,000 cycles per second. The natural or resonant frequency of this power is determined by the tuned circuit, consisting of the oscillator tank coil and the tank condenser. Water-cooled copper tubes conduct this high-frequency power to the inductor heater coil. Based on a strip speed of 1,000 f.p.m. an oscillator of 1,200 kw. output is required for most commercial strip. Connections for the equipments are shown in an accompanying diagram.

By the induction heating method peaks of tin are leveled on the sheet. Dull, rough electrolytically tinned steel sheet passes into the inductor heater coil, where it is heated to the fusion point of tin. Within 0.7 of a second after a 36-in. wide strip enters the coil the temperature is brought up to 450 deg. F., where the tin melts and starts to flow into a smooth, even and bright shiny surface. The heating is done in 10 to 12 ft. of travel when the strip is passing through the inductor coil at 1,000 f.p.m. Melting action stops when the strip moves out of the coil and is cooled by water.

The flowing-of-tin operation becomes an integral part of the tinning line, instead of a separate operation requiring an additional handling of the strip.

Output of tinplate can be increased. Present electrolytic lines operate at a speed of 500 f.p.m., but are expected to go up to 1,000 f.p.m. This high-frequency heating method can easily match the higher speed, whereas gas furnaces have been limited to 150 f.p.m. and hot oil to 250 f.p.m. Power input may be adjusted readily to accommodate changes in the speed of the line. A speed change simply means a corresponding change in the power input to the heater coil.



CONNECTION DIAGRAM of 200-kc. induction heating equipment to flow electrolytically deposited tin plate

Insulator Change Stops Flashover

It is accepted theory that when two otherwise identical transmission circuits are subjected to the same lightning stroke flashover will occur first on the line with the lowest level of insulation.

This theory has been applied by the Toledo Edison Company to the solution of a transmission protection problem involving an important 69-kv., double-circuit, steel-tower transmission line with overhead ground wire. The two circuits involved are in parallel and are protected by cross-differential relaying.

In the past lightning strokes to this line had almost invariably resulted in simultaneous flashover of both circuits, "freezing" the relays and causing an outage on both circuits. Since this was an important double-circuit line and the capacity of both of the parallel circuits is required to serve the load—except for very brief intervals—this condition could not be tolerated, especially in view of the growing war industry load around Toledo.

It seemed evident that an increase in the insulation level of one circuit over that of the other would cause the circuit with the lower insulation level to flashover, drain off the surge and leave the one with the higher insulation level in service to carry the load until the first line was restored. Accordingly, the number of disk insulators on one line was increased by adding one disk to each string, providing that line with a 72-kv. insulation level, while the other remained at a nominal 66-kv. level.

Since these changes were made the line has gone through an entire light-

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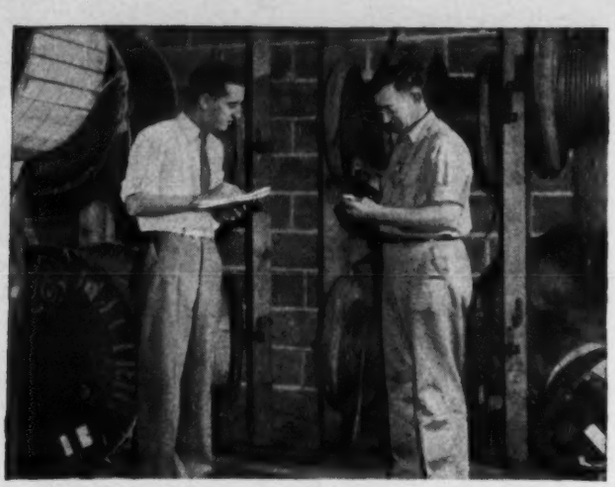
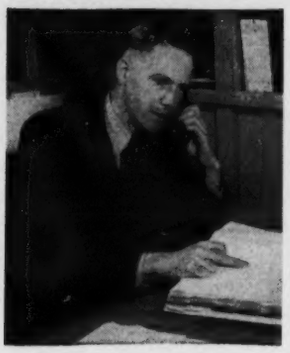
Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

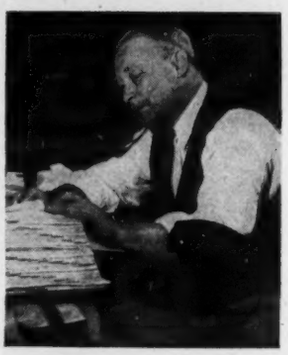
Louis Schumacher (left), is shown in the photograph visiting the General Electric Supply Corporation in Kansas City, Mo., to check over blueprint with J. E. Kerby, Supply Corporation salesman, concerning wiring materials required by changes.



H. K. Phillips (right), and Ben Lang, warehouse supervisor and office manager, respectively, for the Electra Supply Co., Inc., Poughkeepsie, N. Y., G-E distributor, are here checking cable in stock to fill a rush war order.



San Francisco, Calif., General Electric Supply Corporation salesmen, like salesmen for other G-E distributors everywhere, are always busily engaged in helping customers. Here Donald H. Noble (top left), ship fittings specialist, C. C. Johnson (top right), and S. W. Pors (right), are checking materials needed by their customers for rush jobs.



J. E. Moragas, Jr. (right), branch operating manager, General Electric Supply Corporation house, Jackson, Miss., is helping F. J. Guice (left), Mississippi Power & Light Co., Jackson, and H. T. Drane, purchasing agent, same utility, to choose special purpose wiring maintenance materials.

ning season satisfactorily. This experience, however, is not considered conclusive by company engineers. They do feel, however, that in similar situations a change in insulation level should be among the steps considered.

•

Cold Cathode Tubes Used on Relays—II

By E. C. SCHURCH
Senior Electrical Engineer, Electrical Design Section, Bureau of Reclamation, Denver, Colo.

An overcurrent relay has been developed which uses cold cathode gas-filled tubes as a fault-detecting agent. The circuit for an overcurrent-type relay is shown in Fig. 1.

Ratio of the auxiliary current transformer T_1 is such that a drop of about 80 volts is obtained across resistor R_1 when 5 amp. is flowing in the primary with the relay set for 5 amp. minimum pick-up. Since only about 2:1 increase in the voltage E_1 is required to obtain relay operating speeds from several seconds to instantaneous operation, the transformer T_1 is designed to saturate so that the operating range of the relay falls above the knee of the ratio curve. This permits the use of a small transformer with low losses, prevents excessive voltages on the secondary and excessive burden at high overcurrents. The saturation is controlled by the loading resistor R_1 and the design of the transformer.

Time-delay operation of the relay is obtained by charging the condenser C_1 through the high-resistance R_2 by means of half-wave rectified voltage supplied from the transformer T_1. At the beginning of a positive half cycle, nearly all the drop is across resistor R_2 and there is very little drop across the condenser C_1, which prevents voltage E_2 from rising immediately to the breakdown point of the tube grid circuit. Voltage across condenser C_1 rises as C_1 becomes charged. The amount of charge accumulated on C_1 on each positive half cycle depends on the voltage E_1 applied.

At all values of E_1 below the relay pick-up point, as shown by curve E_{1a} of Fig. 2, the charge accumulated in the active half cycle leaks off at a definite rate through resistors R_3, R_2, and R_1 and the rectifier during the inactive half cycle, as illustrated by curve E_{2a}, and the voltage E_2 will not reach the breakdown point of the tube grid circuit. As E_1 increases above the relay pick-up point, as shown by curve E_{1b} of Fig. 2, more charge accumulates on C_1 each active half cycle than can leak off during the inactive half cycle, and the voltage E_2 gradually rises to the breakdown point of the tube grid circuit, as illustrated by curve E_{2b}. Condenser C_1 then discharges through the tube grid circuit, initiating conduction of the tube anode circuit. If E_1 is sufficiently high, C_1 will be completely charged in the first active half cycle and instantaneous relay operation will result. Resistor R_4 protects the tube from the condenser discharge at high values of overcurrent.

The pick-up value of the relay is adjusted by taps on transformer T_1 and the adjustable resistor R_1. The operating time is adjusted by changing values of C_1, R_2 and R_3. The operating characteristics are similar to those obtained with an induction-type overcurrent relay.

A differential type relay and a directional ground relay will be described in subsequent articles.

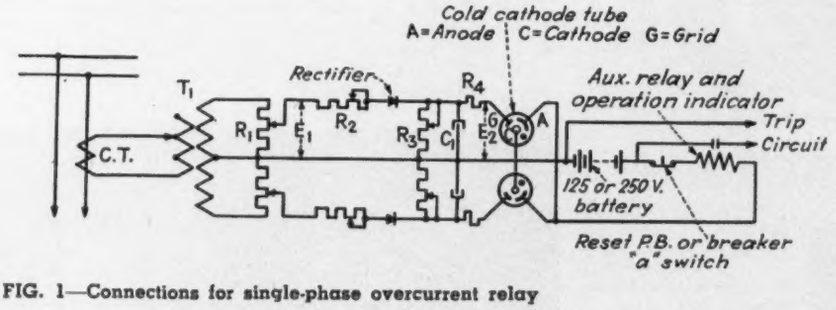


FIG. 1—Connections for single-phase overcurrent relay

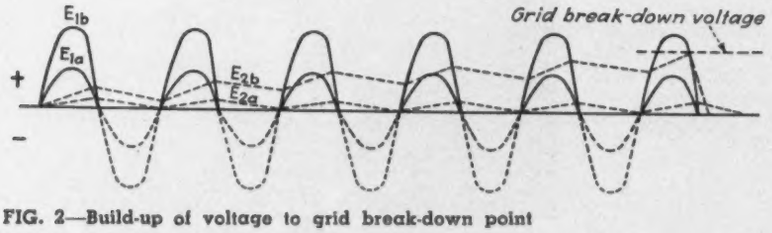


FIG. 2—Build-up of voltage to grid break-down point

•

Resistor Used With Rotating Standards

Each rotating standard used for testing polyphase meters has been equipped with a resistor for determining 50 percent lagging power factor for testing purposes—this has been the practice, for a number of years, of several Eastern utilities.

A Ward Leonard vitrohm resistor or equivalent of 3,000 ohms resistance, $\frac{3}{8}$ in. in diameter and $1\frac{1}{2}$ in. long, is satisfactory on voltages from 115 to 460. This should be installed inside the standard, connecting one end of the resistor to one of the potential binding posts and the other end to an auxiliary post installed for the purpose. The auxiliary post should be so arranged that the leads cannot be connected to it permanently.

If the test current of a watt-hour meter is taken from a phase of a three-phase circuit other than that to which the potential coil of the meter is connected a 50 percent power factor condition will be obtained, and it may be leading or lagging, depending on the phase selected. If a suitable resistor is cut in series with the potential coil of the standard under such a condition the standard will increase in speed appreciably if the fictitious power factor is leading, and if lagging will slow down appreciably, stop or reverse.

When a phase shifter or a predetermined marked source of supply is used, as in shop tests, it is not necessary to make the identifying test. The practice of predetermined phase rotation of course could be extended to all service meters, thereby eliminating the necessity of making the identifying test, but this idea would probably be impractical on an extensive system where phase identification has not been maintained throughout.

Electrical failure somewhere in your plant may be more imminent than you think . . . .

WARTIME restrictions make copper products hard to get—this includes electrical wire and cable. It will pay you to protect what you have. Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused . . . to detect electrical weaknesses that can be corrected.

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NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

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TRANSFORMER FUSING

By H. L. LOWE, Ebasco Services, Inc., New York

6. Suggested Schedule

This is the sixth and concluding article of a series which began in December 12, 1942, issue of ELECTRICAL WORLD.

Suggested Primary Fusing Schedules for Distribution Transformers

Transformer, Size, Kva.	2.3-Kv. Delta				2.3/4-Kv. Star				4-Kv. Delta			
	Figs. 1 and 2		Fig. 3		Figs. 4 and 5		Fig. 6		Figs. 1 and 2		Fig. 3	
	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating
1.5	0.7	5 *	1.1	5 *	0.7	5 *	0.7	5 *	0.4	5 *	0.7	5 *
2.5	1.1	5 *	1.9	5 *	1.1	5 *	1.1	5 *	0.7	5 *	1.1	5 *
3	1.3	5	2.3	8	1.3	5	1.3	5	0.8	5 *	1.3	5
5	2.2	10 (8) †	3.8	15	2.2	10 (8) †	2.2	10 (8) †	1.3	5	2.2	10 (8) †
7.5	3.3	10	5.6	25 (20)†	3.3	10	3.3	10	1.9	8 (5) †	3.3	10
10	4.4	15	7.5	25	4.4	15	4.4	15	2.5	10 (8) †	4.4	15
15	6.5	25	11.3	40	6.5	25	6.5	25	3.8	15	6.5	25
25	10.9	40	18.8	60	10.9	40	10.0	40	6.3	25 (20)†	10.9	40
30	13.0	40	22.6	75	13.0	40	13.0	40	7.5	25	13.0	40
37.5	16.3	50	28.2	75	16.3	50	16.3	50	9.4	25	16.3	50
50	21.7	75 (60)†	37.6	100	21.7	75 (60)†	21.7	75 (60)†	12.5	40	21.7	60
75	32.6	100	56.4	150	32.6	100	32.6	100	18.8	60	32.6	100
100	43.5	150	75	200	43.5	150	43.5	150	25	75	43.5	150

Transformer Size, Kva.	4/6.9-Kv. Star				6.9-Kv. Delta				6.9/12-Kv. Star			
	Figs. 4 and 5		Fig. 6		Figs. 1 and 2		Fig. 3		Figs. 4 and 5		Fig. 6	
	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating
1.5	0.4	5 *	0.4	5 *	0.22	5 *	0.4	5 *	0.22	5 *	0.22	5 *
2.5	0.7	5 *	0.7	5 *	0.36	5 *	0.7	5 *	0.36	5 *	0.36	5 *
3	0.8	5 *	0.8	5 *	0.44	5 *	0.8	5 *	0.44	5 *	0.44	5 *
5	1.3	5	1.3	5	0.73	5 *	1.3	5	0.73	5 *	0.73	5 *
7.5	1.9	8 (5) †	1.9	8 (5) †	1.10	5 *	1.9	8 (5) †	1.10	5 *	1.10	5 *
10	2.5	10 (8) †	2.5	10 (8) †	1.45	5	2.5	10 (8) †	1.45	5	1.45	5
15	3.8	15	3.8	15	2.2	10 (8) †	3.8	15	2.2	8	2.2	8
25	6.3	25 (20)†	6.3	25 (20)†	3.6	10	6.3	25	3.6	10	3.6	10
30	7.5	25	7.5	25	4.4	15	7.5	25	4.4	15	4.4	15
37.5	9.4	25	9.4	25	5.5	20 (15)†	9.4	25	5.5	20 (15)†	5.5	20 (15)†
50	12.5	40	12.5	40	7.3	25	12.5	40	7.3	25	7.3	25
75	18.8	60	18.8	60	10.9	40	18.8	60	10.9	40	10.9	40
100	25	75	25	75	14.5	50	25	75	14.5	50	14.5	50

Transformer Size, Kva.	12-Kv. Delta			
	Figs. 1 and 2		Fig. 3	
	Rated Amp.	Fuse Rating	Rated Amp.	Fuse Rating
1.5	0.13	5 *	0.22	5 *
2.5	0.21	5 *	0.36	5 *
3	0.25	5 *	0.44	5 *
5	0.42	5 *	0.73	5 *
7.5	0.63	5 *	1.10	5 *
10	0.83	5 *	1.45	5
15	1.25	5	2.2	8
25	2.1	8	3.6	10
30	2.5	8	4.4	15
37.5	3.12	10	5.5	20 (15)†
50	4.2	15	7.3	25
75	6.3	25	10.9	40
100	8.3	25	14.5	50

NOTE

Fuse ratings based on use of 100 per cent, type "N" fuse links.

* Secondary fuses may be desirable for protection against overload, particularly on long secondaries and rural lines, where system impedance is too high to clear secondary faults by primary fuse operation.

† Smaller primary fuse may be used to give better protection against transformer burn-outs.

Delta-Connected Primary

Fig. 1

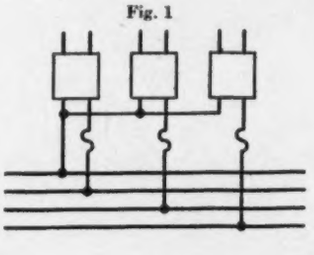


Fig. 2

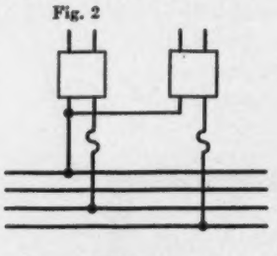
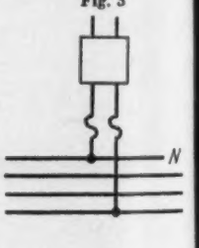


Fig. 3



Star-Connected Primary

Fig. 4

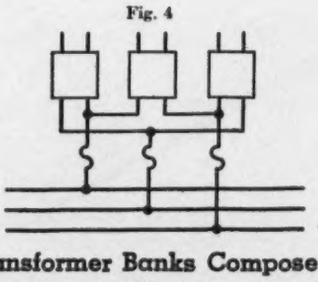


Fig. 5

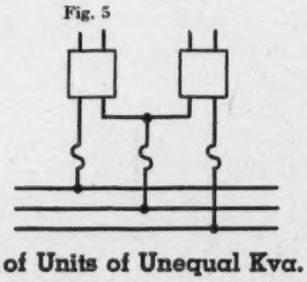
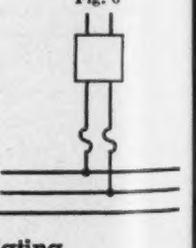


Fig. 6



Suggested Fusing for Transformer Banks Composed of Units of Unequal Kva. Rating

Open Delta — Fuse both leads of larger transformer and one lead of smaller transformer on basis of Fig. 2.

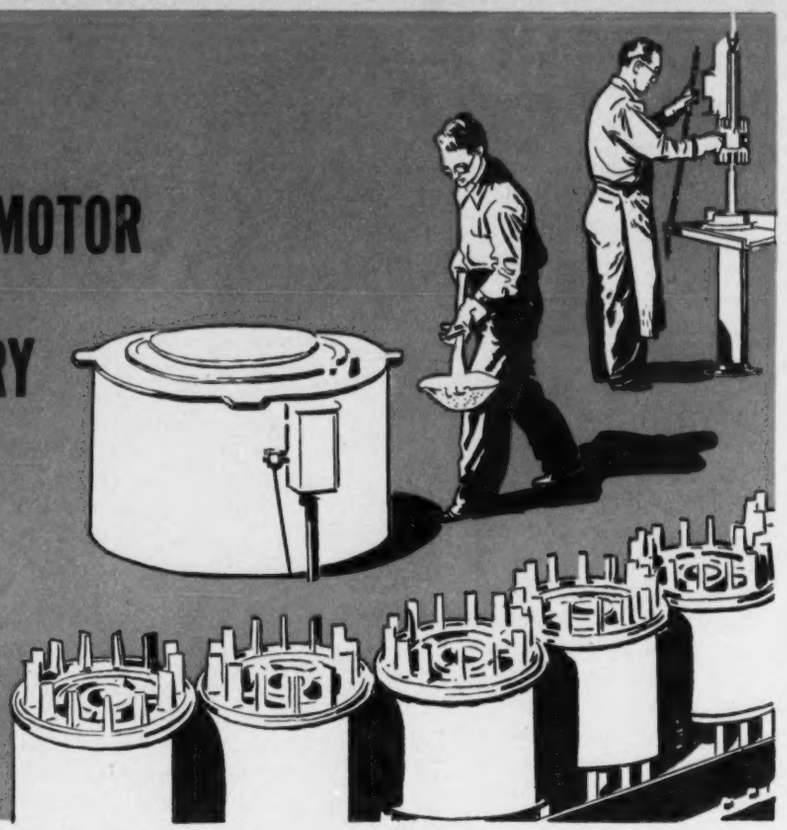
Open Star or Three-Phase Star — Fuse according to transformer size, Fig. 5.

Closed Delta — Fuse both phase connections common to larger transformer according to size, Fig. 1; fuse other phase connection according to transformer size, Fig. 3; if fuse for small transformer is larger than others, fuse all phase connections on basis of larger transformer.

Above schedule may be used as a guide in preparation of revised fusing schedules for improvement of the performance of distribution transformers, by affecting reduction in unnecessary fuse operation, particularly during the present emergency. Primary fuse sizes below 5 amp. have not been shown. Fuse sizes, rated 260 to 400 percent of the rated primary current in the transformers, have been shown for all except the smaller transformer sizes. For the latter sizes fuse ratings in excess of 400 percent of the rated current are suggested, and in addition secondary fuses may be required.

It may be well to point out that the policy of fusing to avoid unnecessary interruptions is as economically sound at one time as at another, consequently its application is not limited to the war period when materials are more difficult to obtain. A careful analysis of distribution transformer performance will indicate the degree to which the practice of employing larger primary fuses should be extended for any particular situation. The final solution will depend upon economics and should include cost of fuses, fuse replacement, transformer maintenance, loss of revenue from outage, and effect on standards of service.

WHY BURDEN A MOTOR WITH UNNECESSARY DEADWEIGHT?



Weight-saving wasn't the aim of the Imagineer who first used cast aluminum rotors in his electric motors. He chose aluminum alloys of different electrical properties to vary the operating characteristics of his squirrel-cage motors. Today, this is standard practice with a number of manufacturers. It simplifies and speeds assembly and it cuts costs.

Now, isn't it time to be doing some Imagineering that has weight-saving as its purpose? Lighter motors may give you an inside track on many a postwar market. No need to take time off from vital war production; include it in your eighth-day thinking.

Aluminum rotors are just a start in the right direction. Weight-saving can undoubtedly be accomplished by using aluminum alloys for other motor parts. Steel inserts can be cast integrally with the aluminum, providing necessary electrical and physical properties and, at the same time, cutting machining costs. The superior heat conductivity of aluminum may even make higher horsepower ratings possible.

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IMAGINEERING AT WORK

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ALUMINUM CABLE STEEL REINFORCED

Neutral Relays Guard Reactors, Generators

By H. E. CHAMBERS
Electrical Engineer Interstate Power Company, Dubuque, Iowa

Until recently the three 13.2-kv. generators at the Dubuque generating station of the Interstate Power Company were operated with the neturals ungrounded because of the absence of overhead exposure that might lead to serious phase-to-ground disturbances, as all feeders connected to the generator bus were in cable. With the recent addition of certain overhead pole-line feeders to the bus, generator neutrals were grounded through reactors at the station to permit the installation of ground overcurrent protection on the overhead feeders.

The three generators at the station had previously been provided with individual differential relay protection and feeders from the generator bus were equipped with overcurrent protection. However, up to this point no means had been provided to protect station equipment in the event of a fault upon the generator bus itself. The separate phases of the bus were adequately separated by physical barriers, thus making a phase-to-phase bus fault a very remote possibility. Since the system operated with ungrounded neutral, single line-to-ground faults were not a problem. Also, the fact that all feeders were in cable, well shielded from lightning surges, lessened the probability of line-to-ground flashovers on the bus.

However, with the addition of exposed overhead feeders and installation of neutral reactors having a one-minute rating, some form of protection was necessary to keep line-to-ground currents caused by sustained ground faults on the bus from destroying the short-time rated neutral reactors and possibly crippling the station for sustained periods. It was also thought desirable to provide additional back-up protection against severe ground faults on the feeders.

To provide this protection, one current transformer was installed in the ground lead of each generator reactor. Secondaries of each current transformer were connected to an induction overcurrent relay, one relay being installed for each current transformer.

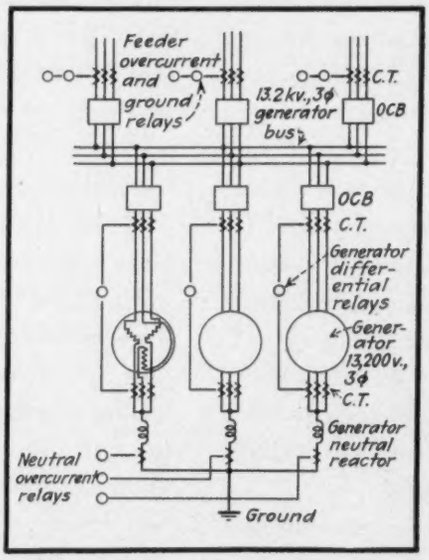
Each of these relays was set to close its contacts at a value of current of approximately 60 percent of the one-minute current rating of the generator neutral reactor with which the relay is associated. A fairly long time setting is used for these relays so that if ground faults are cleared by feeder relays and breakers no operation of these generator neutral relays occurs.

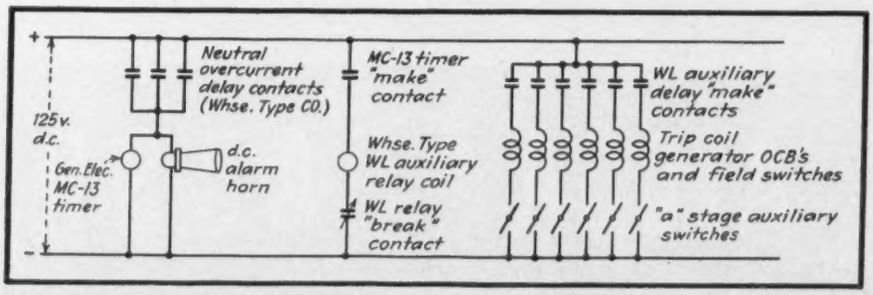
However, if a heavy ground fault on a feeder is not cleared, due to failure of feeder relays, or in case a ground fault occurs on the otherwise unprotected generator bus, the generator neutral overcurrent relays operate to energize an alarm, and at the same time to start a timer. The timer functions to trip the three generator breakers simultaneously if the ground fault current persists for one full minute after the alarm is sounded.

The one minute between the sounding of the alarm and tripping of the generator breakers gives the operator time to look the situation over and take whatever action the conditions warrant. If he fails to act, however, an auxiliary relay actuated by the timer clears all generators from the bus and opens the generator field switches.

Because of the likelihood of station a.c. sources being disturbed by a serious bus fault, timer operates on direct current supplied by station battery.

This system of relaying on the generator neutral ground system at the Dubuque generating station performs for line-to-ground faults the same general function as a much more expensive bus differential protection scheme at much lower investment cost and with much less use of critical material. It also provides back-up protection for severe line-to-ground faults on feeders which might damage the reactors if allowed to persist.




+
125 v. d.c.
−
Gen. Elec. MC-13 timer
Neutral overcurrent delay contacts (Whse. Type CO.)
d.c. alarm horn
MC-13 timer "make" contact
Whse. Type WL auxiliary relay coil
WL relay "break" contact
WL auxiliary delay "make" contacts
Trip coil generator OCB's and field switches
"a" stage auxiliary switches

OVERCURRENT RELAYS in grounded generator neutral protect reactors and generators against excessive currents arising from sustained bus or feeder ground faults

•

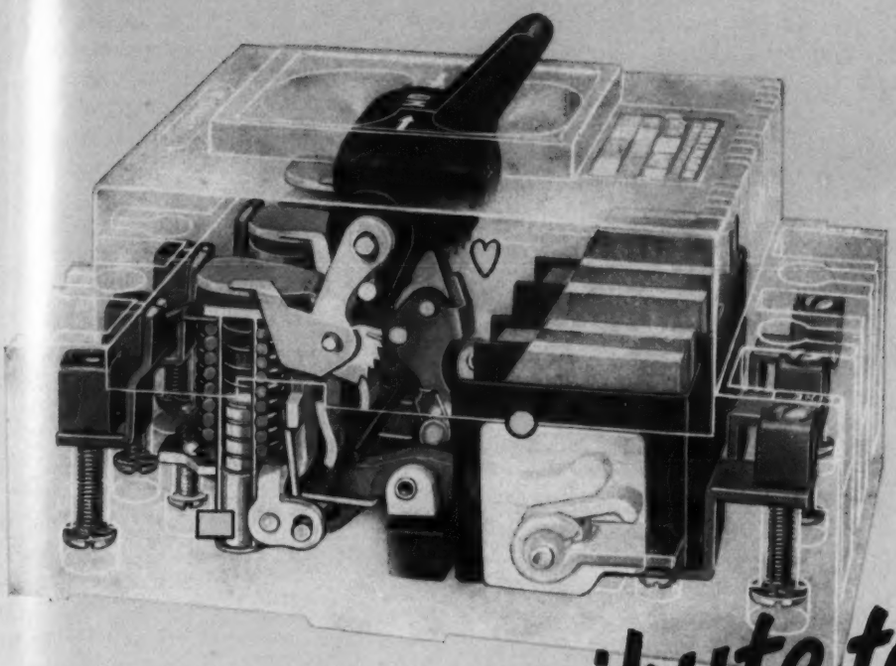
Maintenance of Insulating Oil

IX. Carbon Contamination*

By L. M. LIMPUS
Superintendent of Reclamation Oklahoma Gas & Electric Company

As free carbon is found almost exclusively in oil circuit breakers, appearing in transformers and regulators only after long periods of excessively high temperatures or following an internal failure of the winding insulations, this discussion will be limited to the hazard of free carbon as normally found in the circuit breaker tank. Minute particles of carbon tend to settle out and form conducting layers upon the surfaces of the various insulating materials beneath the oil line, thereby in time decreasing the creepage strength of these insulating surfaces to a point of failure, either at constant line potential or when stressed by surges. A secondary hazard appears when moisture is present. The carbon, having a definite affinity for moisture, not only picks it from the oil and holds it in intimate contact with the sur-

*This series began in the October 31, 1942, issue of "Electrical World."



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HEINEMANN CIRCUIT BREAKER CO.

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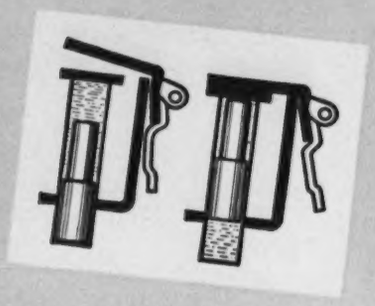
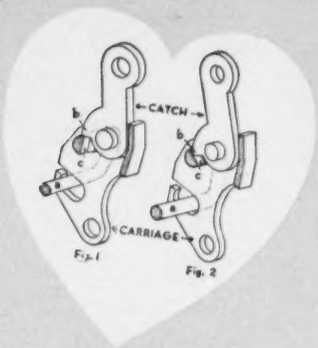
43 PLUM STREET **TRENTON, N. J.**



TIME DELAY ON OVERLOADS

The magnet coil surrounds a hermetically sealed liquid filled cylinder containing an iron plunger which while normally out of the magnetic field moves into it on overloads, the liquid controlling its speed. As the plunger rises to the top of the cylinder, the magnetic flux increases to its maximum. At this point the armature is attracted and operates the latch.

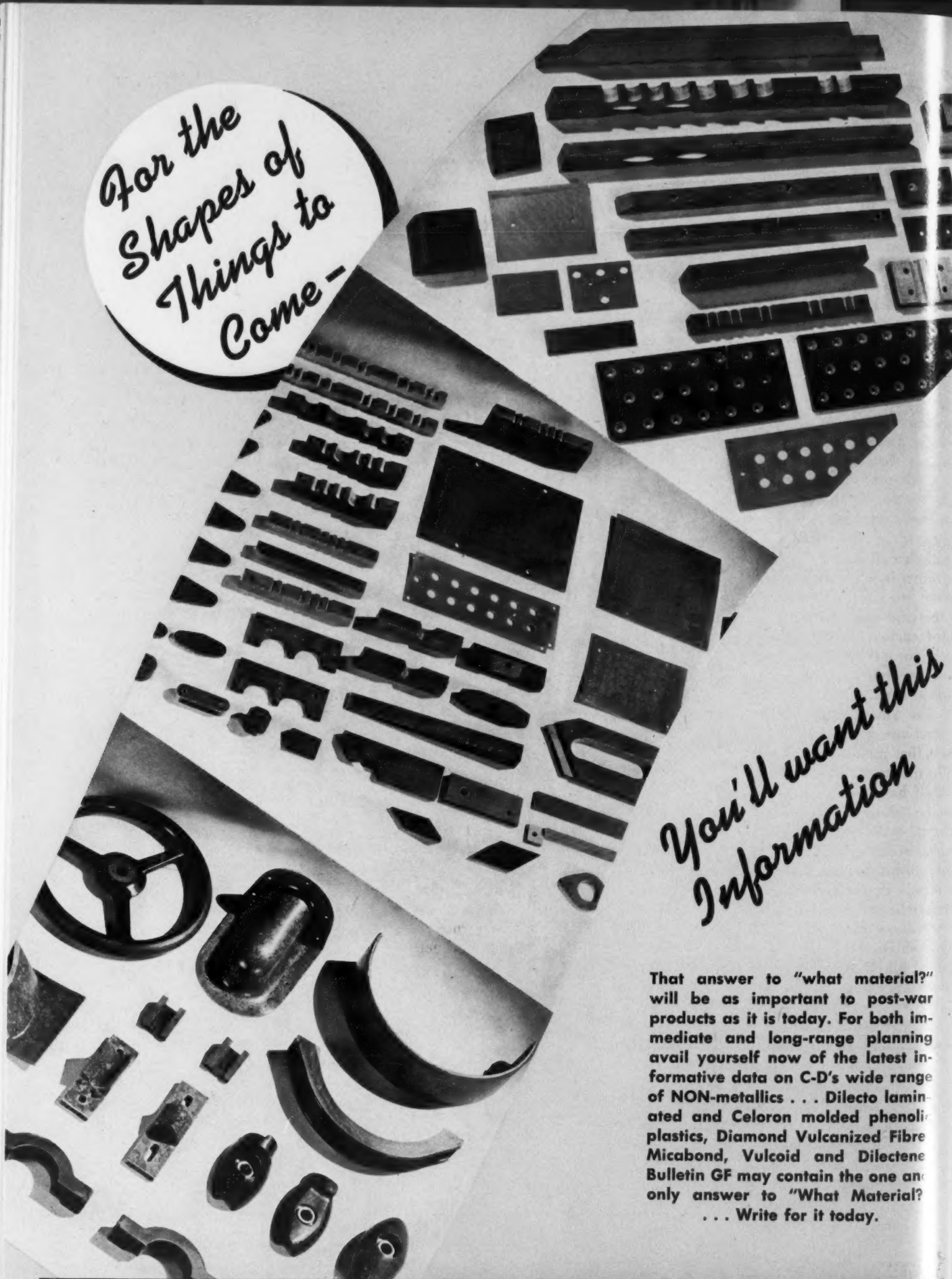


HIGH SPEED LATCH

The armature, on engaging the lower leg of the lock (a) rotates it so that the tooth of the catch (b) passes through the cut portion of the lock (c) and opens the contacts. Of all known latches this one acts with the least amount of friction and mechanical delay. The latch collapses only on short circuit or overload conditions even if the handle is purposely held in the "on" position.

HIGH SPEED BLOWOUT

The stationary contact is coiled around an insulated iron core connecting steel plates to form a U-shaped magnet. On overloads and short circuits, the current flowing through the contact creates magnetic lines which force the arc into the arcing chamber and blow it out. As the value of the current to be interrupted increases, the quenching effect becomes greater due to intensified magnetic field.



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faces of fibrous or cellulose insulations, but may also transmit this moisture to the internal cells of such insulations, thereby weakening their puncture as well as their creepage strengths.

Effect on Dielectric Strength

A small percentage of finely divided carbon black, added to a mineral insulating oil, materially increases the dielectric strength of such an oil when tested in the standard oil test cup. It is also known that the dielectric strength, as measured in the cup, is materially reduced when a larger percentage is added. This might lead one to believe that a concentration of carbon, sufficient to lower the dielectric strength to a test value less than the standard 17,000 volts minimum, might during arc interruption permit the arc to restrike again and again through several current zeros, or allow an actual puncture of the oil barrier regardless of the manner in which it was introduced into the arc stream. However, this is not the case and the amount of deposited carbon or the degree of its dispersion has little, if any, effect upon the ability of an oil breaker satisfactorily to interrupt a circuit.

It was shown recently (A.I.E.E. Transactions, September, 1941, pages 903-6) that the amount of either carbon or moisture contamination in the oil itself has a very negligible effect upon the "all-over" dielectric strength, either 60 cycle or impulse, of the assembled breaker, because of the much greater or longer gaps as compared to the standard test cup. Carbon must therefore be considered a hazard only as it reduces the creepage strength of the insulating surfaces, functions as a carrier and distributor of moisture, or acts to decrease the insulating oil's normally high resistance to emulsification (its ability to precipitate moisture, refusing to permit it to remain in suspension within the body of the oil).

Free carbon is a very finely divided substance, appearing in the general form of lamp black or powdered charcoal, and produced by the decomposition of the insulating oil when subjected to the intense heat of an electric arc appearing with the parting of the breaker contacts. It is ordinarily found in two different forms—colloidal carbon so finely divided that it remains in suspension for several days, discovered as a distinct blue-black discoloration of the oil, and precipitated upon the vertical surfaces of the bushings, lift rods, tank liners and around the oil line as a sticky asphaltic paint or varnish, and a heavier more granular substance which settles out completely within 24 to 36 hours, leaving a black, pasty deposit on the horizontal surfaces beneath the oil line. Colloidal carbon sometime requires a solvent to remove it while the heavier carbon is readily dispersed by slight agitation of the surrounding oil.

•

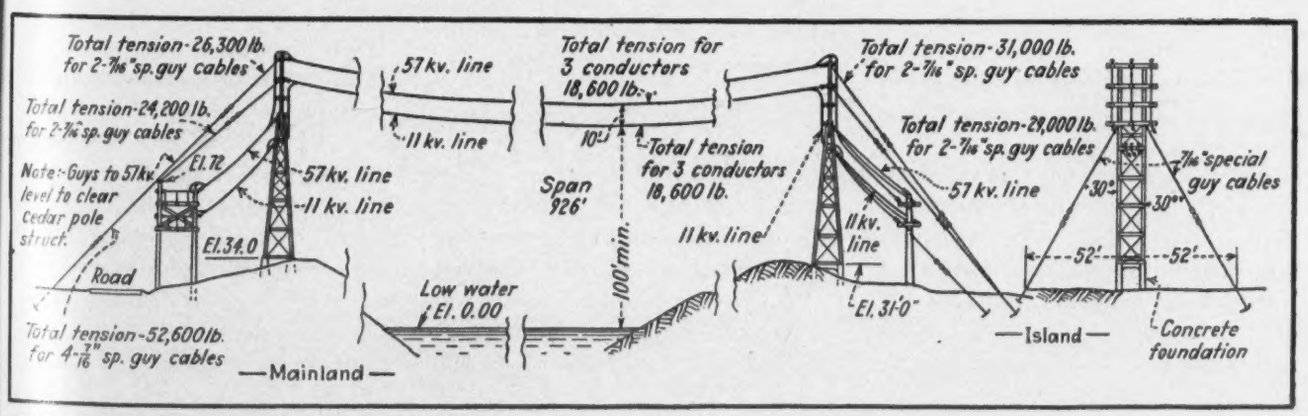
96-Ft. Wood Towers for Channel Crossing

Two framed timber structures were recently erected by the Portland General Electric Company for a 57-kv. overhead river crossing. The towers were built of prefabricated, preservatively treated timber, are 96 ft. high above the concrete footings and are 12 ft. x 12 ft. center to center of columns at the base. Corner posts and upper extensions are designed as columns. Most of the timber connections are made with ¾-in. bolts and malleable washers, all galvanized.

TOWER of framed timber (right)

After fabrication, the Douglas fir timbers were pressure treated to a retention of 0.3 lb. of Wolman Salts preservative per cubic foot of wood. The towers were designed by Timber Structures, Inc., Portland, Ore., under the supervision of Walter Brenton, chief engineer, P.G.E. Co. "Wolmanizing" treatment was conducted in retorts of the American Lumber & Treating Co.'s Wauna, Ore., plant.

The towers carry three No. 6 AWG copperweld conductors—with a span of 926 ft.—across a channel of the Columbia River. The crossing will finally carry two circuits (57 kv. and 11 kv.), with each set of conductors to be guyed independently. Additional details are given in the channel-crossing illustration.



PROFILE of channel crossing

GUIDE TO USE OF

60-CYCLE UNIVERSAL TRANSMISSION LINE CHART—II

By J. M. SHEPLEY and C. B. WALTON
Bureau of Water Power, Federal Power Commission, Washington, D. C.

Analysis of a 60-cycle transmission line with hard-drawn stranded copper conductors may be made by use of the specially developed chart published in ELECTRICAL WORLD, February 6, 1943, issue, page 72. The following examples illustrate the use of the chart for supplementary wire sizes and for determining requisite synchronous condenser ratings.

EXAMPLE No. 1

Consider a three-phase transmission line, whose length, frequency, equivalent spacing, size of wire and receiving-end voltage are the same as in the example accompanying the chart.

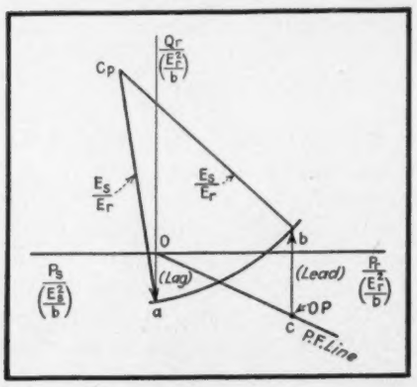


FIG. 1—Step in determining size of synchronous condenser

Find the minimum size synchronous condenser required to maintain constant receiving- and sending-end voltages for a load that varies from zero to 125 Mw. at 0.9 power-factor lag and determine the value of the sending-end voltage.

Assume that the condenser has a lagging capacity equal to 60 percent of its loading capacity and neglect losses.

Compute

$$\frac{P_r}{\frac{E_r^2}{b}} = \frac{125}{\frac{(220)^2}{167.7}} = 0.4331$$

Locate the operating point as previously done.

Swing an arc as shown in Fig. 1 with radius such that the length of the line *(oa)* = 0.60 *(bc)*. The length of the line *(bc)* is 2.30 centimeters or $Q_r/(E_r^2/b)$ (lead) = 0.230

$$Q_r = \frac{220^2}{167.7} \times 0.230 = 66.4 \text{ Megavars leading}$$

The length of the E_s/E_r line is 10.51 in. or $E_s/E_r = 1.051$ $E_s = 220 \times 1.051 = 231.2$ kv.

EXAMPLE No. 2

For a size wire not shown on the chart, for example, 700,000-cir. mil hard-drawn stranded copper at 25 deg. C., it is desired to locate the center point and the value b to be used for making computations on the chart for a 200-mile, Δ= 20-ft. line. From a manufacturer's tables the resistance per mile of wire is 0.0873 ohm and the impedance per mile is 0.790 ohm.

$$\frac{r}{Z} = \frac{0.0873}{0.790} = 0.1105$$

From the chart $l_r' = 194.5$ and

$$b = l_r' \times Z = 194.5 \times 0.790 = 153.7$$

Locate center point by extending a vertical line at the abscissa $P_r/(E_r^2/b) = r/Z = 0.1105$ until it intersects the zero-mile locus, and then proceed parallel to the adjacent wire size lines until the 200-mile locus line is reached (see Fig. 2).

Incidentally, the same method may be used for different types of conductors, materials and temperatures to a good degree of accuracy, by knowing the resistance and impedance values. The aluminum cable steel-reinforced chart may also be used in this manner, and a check for the location of the center point may thus be made. The chart which most closely fits the type of material should be employed.

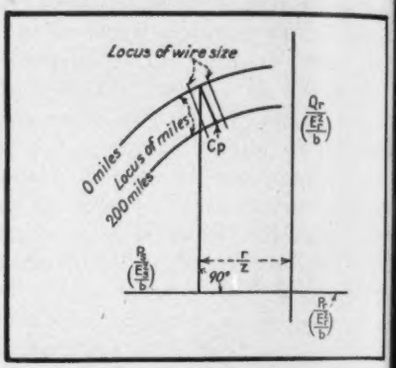


FIG. 2—Locating center point when a wire size is not shown on chart

Note that as a special case the center point for a series impedance is always located on the zero-mile line. By computing r/Z as above the center point is located by going vertically at the abscissa $P_r/(E_r^2/b) = r/Z$. By using the cantilever equivalent for the sending- and receiving-end transformers it is obvious how the solution of a transformer problem is made.

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1. "Brother, the boss sure caught this one just on time. A little more and she'd really been shot."
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"Oh I don't know. seen worse in my Why I can re- nber . . . ."
5. "That's what I always say. We're the guys that make motors last longer."
3. "There he goes again. He can always remember motors in worse condition than anything we see nowadays."
4. "Well, maybe he's got something this time. Insulation's a lot better now than when he was young, so motors are better protected."
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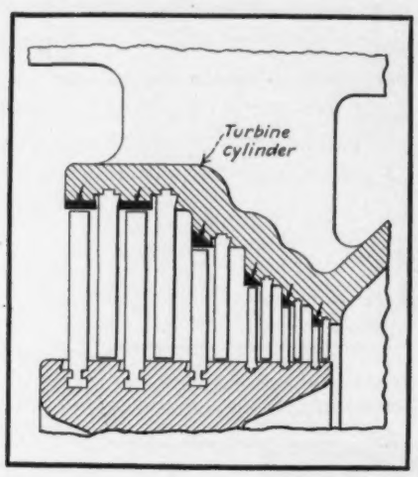
GENERAL ELECTRIC

Turbine Blade Base Rebuilt By Welding*

Repair expense was reduced approximately 80 percent and time saved was greater than 50 percent by the use of arc welding in relining steam turbine cylinders at the base of blades on a 4,000-kw. turbine. The repair work was done in the Columbus, Ohio, municipal power plant, where Fred E. Schubert is chief engineer in charge of operation and maintenance. This plant supplies electric power to many war industries. Steam loss due to cylinder erosion at the base of the blades was a serious problem.

The blades being attached to outer shroud rings were removed in units. Calking strips and "lifeless" metal, about $\frac{1}{8}$ in., were removed by an air-operated chisel. A row of $\frac{1}{8} \times \frac{3}{8}$-in. long steel screws were installed on 1-in. centers.



ARC WELDING was used to build up steam turbine cylinder at locations indicated by arrows; section of casing shown

Bars of copper, $\frac{5}{8} \times \frac{3}{4}$ in., were used to make a form to rebuild the channels and grooves. They were machined on one side to a 20-deg. angle to duplicate the angle of the grooves that hold the calking strips, which in turn hold the turbine blades. The copper bars were then rolled to the curvature of the cylinder and wedged into the grooves formerly occupied by the blades.

By arc welding, using 300 amp. at 50 volts d.c., $\frac{1}{8}$-in. diameter electrodes were fused with the cast-iron cylinder and $\frac{1}{8}$-in. steel screws. Thus the cylinder was built up to the top of the copper bars. Location of the welding is shown in the accompanying illustration.

When the welding operation was completed the copper bars were removed from the cylinders, exposing new welded metal. The metal was in condition to receive the turbine blades without requiring any machine work. A hand-grinding wheel was used a very short time to smooth the top of the weld.

Time required to complete the repair work on the 4,000-kw. steam turbine was 52 days and cost was approximately $5,000. In comparison a 6,000-kw. turbine was repaired for the same reason. For this latter job a boring bar was set up and the blade channels bored out to permit insertion of brass liners, which, in turn, were bored to permit installation of the blades. This job was completed in four months and at an approximate cost of $25,000.

*Adapted from paper submitted in contest for award by The James F. Lincoln Arc Welding Foundation.

•

Cracking of Turbine Expansion Joint

By RALPH R. HAWKINS
General Superintendent Patchogue Electric Light Company, Patchogue, N. Y.

Vertical cracks, presumably due to fatigue, were discovered in the bellied portion of the single-corrugation of the expansion joint between our 3,000-kw., 3,600-r.p.m. turbine and its condenser. Slight hiss of escaping steam could be heard when steam was admitted to the turbine and before the repairs could be made the vacuum gradually slipped from 28½ to 21 in. of mercury under heavy load. The first two cracks in the copper were welded, but later examination by means of kerosene and chalk showed that the cracks extended up under the rings. There they were inaccessible to the welder.

The turbine was dismantled and lifted from the base high enough to remove the defective expansion joint and install a new one. While this was done the blades, governor, etc., were cleaned and overhauled and the primary valves remachined.

The fatigue is thought to be attributable to the intermittent use of the unit to assure continuity of service and to carry the load over the peak period from 4 to 11 p.m., the cyclic change in temperature probably aggravating the stress on corrugation. For some of the time the main steam valve was leaking steam through the shutdown turbine to the condenser. Repair of the valve and the joint have restored efficient operation.

•

Skin and Proximity Effects on Buses*

By WILLIAM DEANS
Chief Engineer
I-T-E Circuit Breaker Company, Philadelphia

For the rapidly changing current, whether alternating or unidirectional, the current is crowded into the outside or skin of the conductor, hence the name "skin effect." From a practical and economic point of view, it would seem therefore that the center of the conductor should be omitted particularly for alternating current.

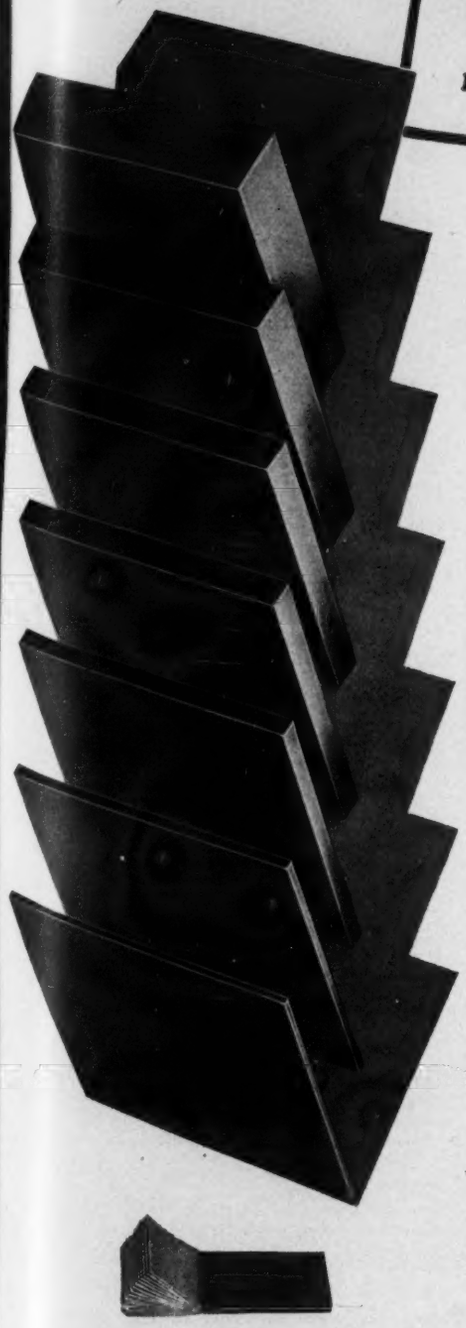
A comparison between the performance of a solid rod and a tube is interesting. If we consider conductors of the same outside diameter, the effective resistance of the tube decreases rapidly with an increase in the thickness of the tube, reaches a maximum, and then increases, then remains constant, up to a thickness of tube equivalent to a solid conductor. In other words, there is an optimum thickness of wall of tube for a given frequency. It is rather curious to note that this optimum thickness is of the order of 0.6 in. for copper tubes of diameters up to about 4½ or 5 in. at 60 cycles. For different frequencies, a different condition would result. The optimum thickness of the tube would be greater for 25 cycles than for 60 cycles. The solid conductor would, of course, be the best for direct current, which corresponds to zero frequency.

The proximity effect is pronounced on alternating current and rapidly changing direct current (latter existing in practice in case of a short circuit), but since it depends upon inductance, it does not exist for unidirectional constant current. It depends upon the magnitude and frequency of the current, upon the spacing and the arrangement of the conductors, upon the presence of magnetic materials in the field. The mat-

*This is the fifth of a series of seven articles on the general subject of Bus Design, which began in the December 26, 1942, issue of "Electrical World."

STRENGTH

Tensile Strength	7,500-12,000 lbs. per sq. in.
Compressive Strength	25,000-35,000 lbs. per sq. in.
Flexural Strength — Edgewise	16,000-20,000 lbs. per sq. in.
— Flatwise	16,000-20,000 lbs. per sq. in.
Impact Strength	0.6-0.8 ft. lbs. per in. of notch (Charpy or Izod)



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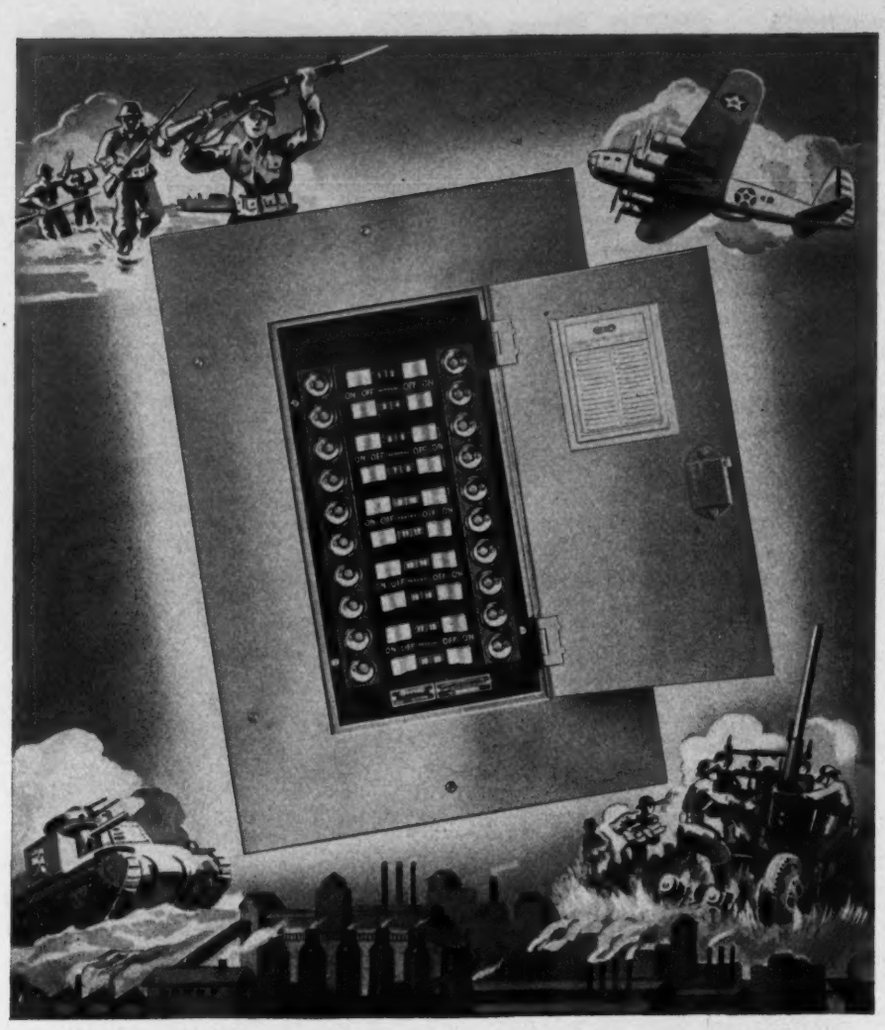

THAT THERE SHALL ALWAYS BE LIGHT

On the production front all over the country men are hard at work making guns, planes, ships, and tanks. Tools for Victory. And Federalite NTPR panelboards are hard at work, too, giving perfect control and protection of lighting and small power circuits.

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ter is rather too complex to enable the effect to be reduced to simple equations. Equations have been worked up for current density over the cross-section of conductors of simple shapes, and these equations are unique with respect to a particular shape of cross-section.

One indirect result of the proximity effect is that the force between the conductors upon the flow of heavy current is increased.

The total result of the skin and proximity effects is to crowd most of the current toward the outside surfaces of the conductors and to crowd most of that current toward one side of the cross-section of each conductor. These effects, therefore, have pronounced consequences in determining the effective resistance of a conductor to alternating current. Together they make the current density non-uniform. The effective resistance of a conductor is higher for alternating current than it is for direct current. This must be carefully considered in choosing the proper shape of the cross-section of the conductor for alternating current.

Both skin and proximity effects are more pronounced the higher the frequency. Usual frequencies found in industrial work are 60 cycles and in some cases 25 cycles, but it might be well to note that the 180-cycle circuits now quite generally used for motorized hand tools must receive careful attention. Otherwise, the voltage drop may be found to be excessive on such circuits or the conductors may overheat.

•

Neutral Stud Releases Needed 66-Kv. Bushings

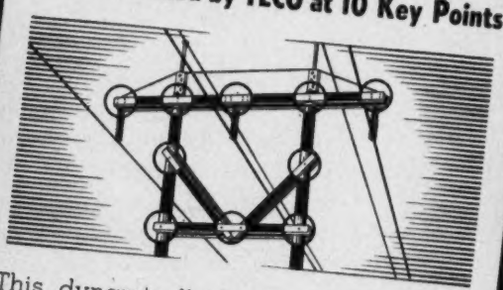
High-voltage transformer bushings, for replacement purposes, are not exactly a "drug" on the market these days, yet the Illinois-Iowa Power Company, Decatur, has found a way to keep an adequate supply on hand.

Where 33- and 66-kv. power and potential transformers are wye-connected, they follow the practice of removing the neutral bushings on each of the three transformers and replacing it with a blank cover. This blank cover carries a stud, to the underside of which the lead from the transformer terminal block is connected. Upper end of the stud is connected to ground and to similar neutral studs of other transformers in

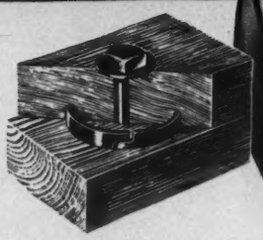
TIMBER H-POLES
For Electric
TRANSMISSION

Sketched from an installation in New York State, erected by the U. S. Engineers and prefabricated by the American Crossarm and Conduit Company, Chicago.

Ring-Connected by TECO at 10 Key Points



This dynamically balanced, all-timber assembly is rigidified at 10 key points with imbedded TECO Ring Connectors. Great strength results and lighter members may be used. Timber, engineered under the TECO Connector System, now releases metal in thousands of wartime structures, light and heavy. It is destined to play a leading role in the great era of reconstruction to come. *Write for our literature today.*



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WASHINGTON, D. C. PORTLAND, OREGON

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This principle and the method of indication are unique among speed measuring instruments. The Frahm Resonant-Reed Tachometer is as accurate as it is simple, with no parts to wear, adjust, lubricate or renew. It can be used in any position and will give years of trouble-free service. Built in types for permanent mounting . . . and for hand use in servicing, installation and maintenance work. Various ranges available from 900 to 30,000 R.P.M.

For a complete description of Frahm Tachometers together with lists of types and ranges commonly supplied, write for Bulletin 1590W.

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the bank. The practice eliminates the need for using the transformer case as the ground connection.

By this simple expedient three of six bushings in each three-phase bank of transformers can be conserved to replace faulty or broken bushings on other transformers.

•

24,000-Kva. Capacitor Speeds Electrons

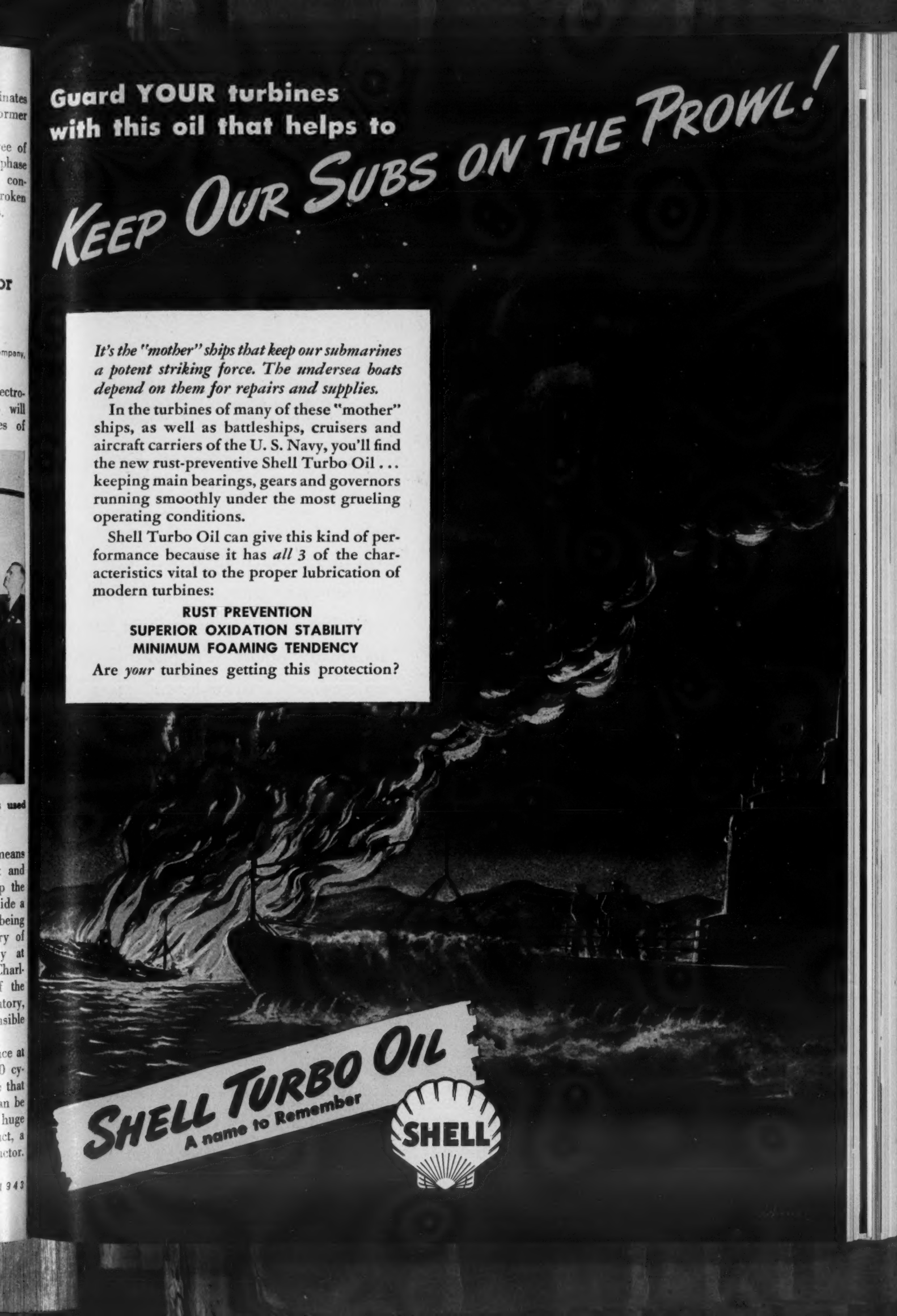
By W. F. WESTENDORP
Research Laboratory, General Electric Company, Schenectady, N. Y.

In a recently developed electromagnetic accelerator electrons will be accelerated up to energies of

ONE of the 16 racks of capacitors used with an electron accelerator

100,000,000 electron volts by means of an increasing magnetic flux and a strong magnetic field to keep the electrons in a circular orbit inside a vacuum tube. The apparatus is being built by the research laboratory of the General Electric Company at Schenectady, N. Y. Dr. E. E. Charlton (see illustration), head of the X-ray section of the G.-E. laboratory, and the author have been responsible for the design and construction.

Since the process will take place at the commercial frequency of 60 cycles per second, it is easy to see that such a varying magnetic field can be maintained only in the gap of a huge reactor. The machine is, in fact, a specially shaped 24,000-kva. reactor.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with this oil that helps to
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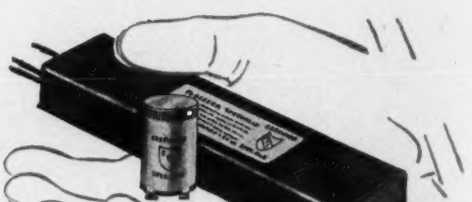
A COPY OF THIS CERTIFICATE SHOULD APPEAR UPON EACH UNIT OR PACKAGE
FLUORESCENT LIGHTING FIXTURES EMPLOYING 4-SISTING TYPES OF LAMPS ARE NOT RECOMMENDED FOR SCHOOLS, OFFICES AND SIMILAR LOCATIONS UNLESS LAMPS ARE SHIELDED FROM DIRECT VIEW

LOOK FOR THIS LABEL ON THE FIXTURES YOU BUY

Minutes count in any kind of war work, that's why equipment *must* stand up, whether it's a lathe or a fluorescent lighting fixture. FLEUR-O-LIERS—meeting 50 rigid specifications set up by expert engineers of the MAZDA Lamp Makers—are built to "take it."

Check these vital features

Impartial experts—Electrical Testing Laboratories, Inc., of New York, test and Certify FLEUR-O-LIERS as meeting such important points as high power factor, flicker correction, brightness control, safety, maximum light output, correct heat dissipation and many others. To plant electricians, maintenance men and production executives, that means more than just "lighting."



Certified Ballasts and Starters Guard the User

For example, ballasts and starters, the "control units" of every FLEUR-O-LIER fixture, are also tested and Certified, *for the protection of user and specifier.* That means full

PLANT!

se of your wiring system, longer lamp ife, more light from lamps, *balanced, dependable operation*—saving minutes that ount big these days.

Non-ferrous reflectors

Non-ferrous reflectors on FLEUR-O-LIERS re covered by the same rigid specifica- ions as the former steel reflectors, hav- ng a high reflection factor, sturdiness, afety, light weight and built to Bureau of Standards design. They are available on suitable WPB priorities.

FLEUR-O-LIERS are made by over 40 leading fixture manufacturers. The FLEUR-O-LIER program is open to any manufacturer who complies with FLEUR-O-LIER standards.

NEW! Famous FLEUR-O-LIER Specifications now in booklet form. Read why FLEUR-O-LIERS are good. Keep the data for ready reference. Write today for booklet and list of manufacturers, to

FLEUR-O-LIER MANUFACTURERS • 2126-2 Keith Bldg., Cleveland, Ohio

FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

HARPER
STOCKS
the UNUSUAL
AND MAKES THE
"Super Unusual"
Think of 4320 stock items of fastenings . . . including almost every conceivable type of bolt, nut, screw, washer and rivet in the non-ferrous and stainless alloys. Such a stock is one of Harper's contributions to a nation at war.
If the fastening you want isn't in this stock, Harper can make it promptly (priorities permitting) on extensive, modern, high speed machinery . . . from stocks of metals in basic forms. Submit your specifications.
BRASS
BRONZE
COPPER
EVERDUR
MONEL
STAINLESS
WRITE FOR CATALOG
. . . and reference book. 80 pages—4 colors—193 illustrations — numerous tables and other data. Free when requested on company letterheads.
The H. M. HARPER COMPANY
2611 Fletcher Street • Chicago
45 West Broadway • New York City
Offices in Principal Cities
ARMY E NAVY
Awarded Dec. 7, 1942
HARPER Chicago
EVERLASTING FASTENINGS

Obviously the 24,000 volts and 1,00 lagging amperes required to mag netize this reactor are not draw from service mains. In order to sup ply this number of kilovolt-amperes bank of 1,000 capacitors is going t be used. Each capacitor is rated 2 kva., 3,000 volts, 8 amp., 60 cycle single phase and 7 mfd. The hig rating is permissible only for thi special application, in which force air cooling, a definite maximum volt age and the absence of surges ar assured.

The capacitors are placed in 1 angle iron racks. Each rack has fiv levels with room for two rows o seven at each level. The racks ar placed in two rows of eight on each side of a center aisle in a room 40 x 12 x 12 ft. All 63 capacitors in each rack are joined in multiple for a operating voltage of 3,000 volts, 6 cycles, and the eight racks in each row are connected in series, making a bank of 24,000 volts and 500 amp with midpoint grounded on each side of the room. All racks are mounted on 15,000-volt porcelain busbar in sulators.

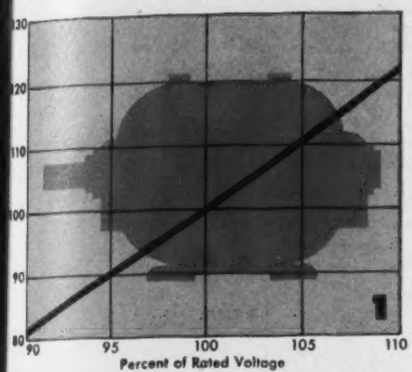
The power loss in this 24,000-kva capacitor house will be 80 kw., to b carried off by a flow of air through the room of 9,000 cu.ft. per minute maintained by means of a blower with filters and automatic louver control located in a penthouse. The temperature rise of the air will be 10 deg.

•

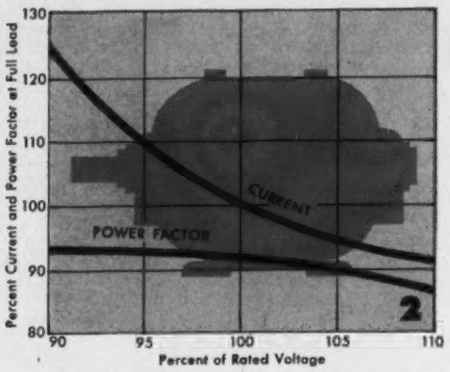
Spotless Cars

A cover cloth for nearby parked cars is standard equipment for painters maintaining street lights at Fort Wayne, Ind. The City Utilities adopted the practice early in its history and found that it not only saved wear and tear on cars but drivers tempers too.

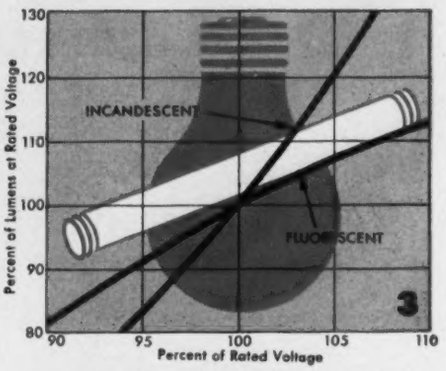
4 strong wartime arguments for VOLTAGE REGULATION



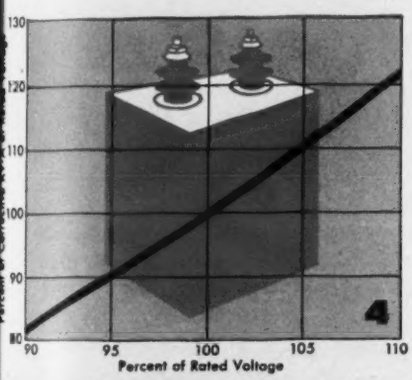
LOW VOLTAGE CUTS MOTOR TORQUE—If rated voltage drops only 5 percent, motor starting torque is reduced by about 10 percent.



LOW VOLTAGE UPS MOTOR CURRENT CONSUMPTION—Example: motors will require 10 percent more current if voltage falls off only 5 percent.



LOW VOLTAGE IMPAIRS PLANT LIGHTING—Continuously good illumination (vital to efficient production) depends primarily on proper voltage conditions.



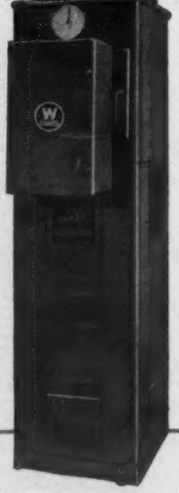
LOW VOLTAGE INTERFERES WITH P. F. CORRECTION—Any voltage drop sharply reduces the effectiveness of capacitors in correction of power factor.

. . . and the copper-saving way to get it!

Westinghouse feeder voltage regulators quickly, effectively eliminate the production sabotage caused by sagging voltage levels. And—by making available more useful kv-a from the same power input—they eliminate the need for new power lines to supply new war plants or wartime plant expansions. In many applications they can save literally tons of vital copper!

To keep production at peak efficiency . . . to supply new power needs quickly . . . to contribute to the war effort worthwhile savings in urgently needed copper . . . get the Westinghouse recommendations on every potential application of voltage regulators. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-10238



Westinghouse builds a complete line of feeder voltage regulators for all types and sizes of distribution lines. Step type regulators for outdoor service . . . liquid-cooled induction type regulators for outdoor and indoor service . . . air-cooled (illustrated) for indoor service.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

VOLTAGE REGULATORS

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Utility Plays Up Local "Women in War" Angle

By JACK LACEY
Advertising Manager
Tampa Electric Company, Tampa, Fla.

How local women can do their part in winning the war and how the war is affecting them are combined in a publicity and promotion theme that the Tampa (Florida) Electric Company is finding to be useful to and appreciated by the community and also helpful to itself. The utility employs three means to help Tampa "Women at War."

Frequent newspaper advertisements of the kind here reproduced play up the war activities and responsibilities of women in local terms. They tell what Tampa women are doing in Red Cross, U.S.O., Nurses' Aid, Motor Corps and many other kinds of war work.

The utility's home demonstration facilities, "Leisure House," in the main office in Tampa are used for canteen headquarters, Red Cross meetings, first aid classes and nutrition instruction. In such activities attendance has been more than 15,000 so far this year. Four different canteen and nutrition courses use the Tampa facilities each week and similar courses are given in the three other "Leisure Houses" in divisional offices of the company.

At ten in the morning on Tuesdays and Thursdays a radio program sponsored by the electric company tells the story of "Women at War." Each program is a dramatization of some local aspect of the women-war theme, carefully put together and competently enacted. Characters are identified and are played by the actual people concerned. Thus the listeners know the circumstances and the events of a program and frequently are acquainted with the actors. This makes for keen interest. A test of 1,000 random telephone calls showed that in homes where the radios were in use at the time 72 percent of the listeners were tuned to the program. It is produced in the style of the "March of Time" with all sound effects.

NEWSPAPER ADVERTISING is one aspect of promotion of local women's war work

More than 75 women have been on the program to date. The series started in September and will continue through next April.

Through these activities, newspaper advertising, participation and help in women's war activities and the radio series, it may be expected that the women of Tampa will accept the Tampa Electric Company as a good friend.

•

Teach Nutrition in Victory Kitchen

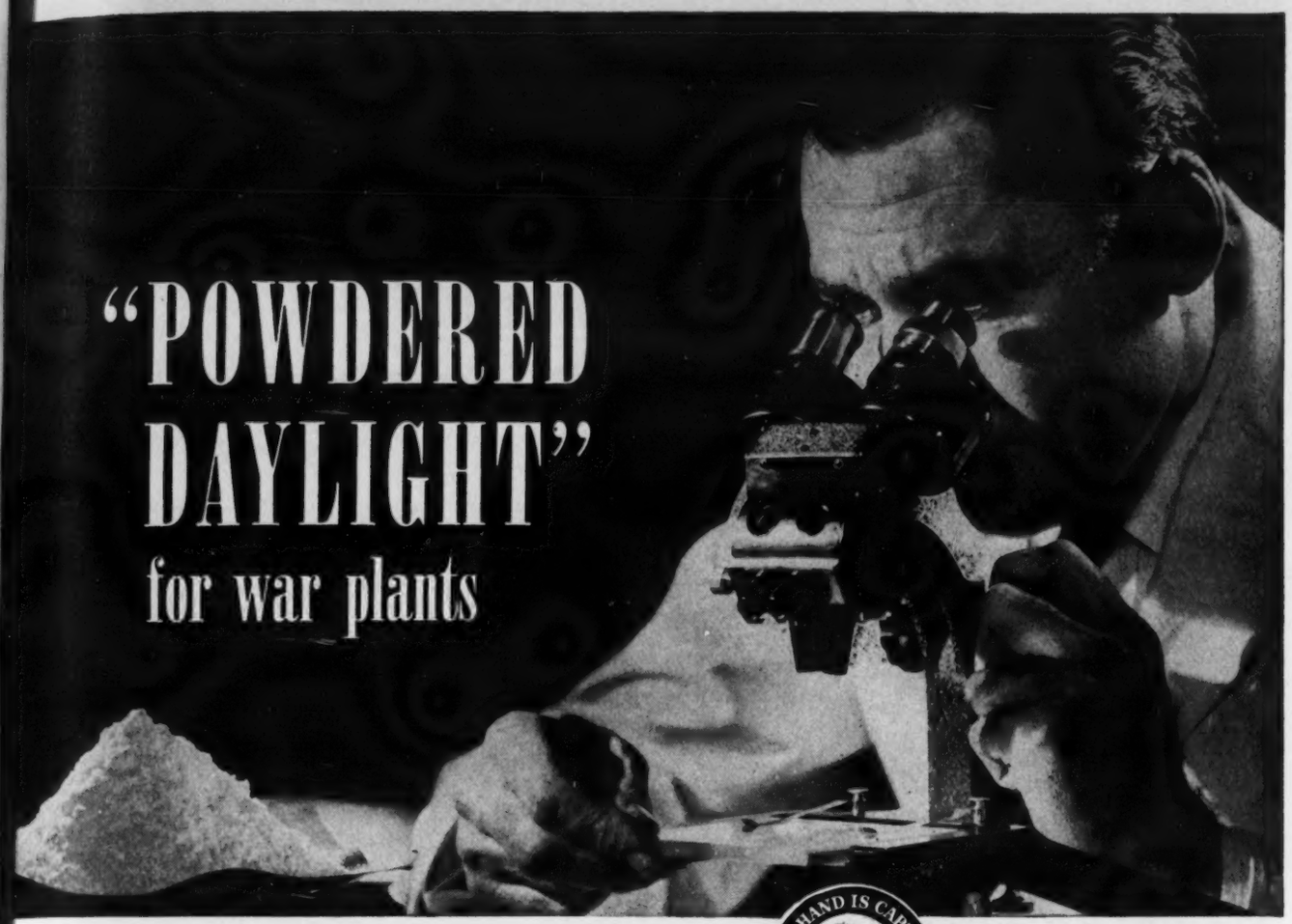
By EDITH T. RAUCH
Home Service Director
Puget Sound Power & Light Company,
Seattle, Wash.

One of the effective measures taken by the utilization department of the Puget Sound Power & Light Co., of which C. E. Hess is manager, in connection with its educational work, is the Victory Kitchen.

Lecture demonstrations are held at the kitchen each week, for the public, to assist homemakers in the selection and preparation of foods that will provide adequate nutrition for their families. Nutrition classes are held for the wives and mothers of men working in wartime industry. Menu and recipe guides including lunch box menus are furnished to those registered for the classes. Information on the daily food requirements and cookery methods are part of the instruction program.

A very intersting series of programs was held recently when cooks from the Army, Coast Guard and Navy demonstrated how men in those branches of the service were fed. Actual meals were prepared before the audience while representatives of the service explained how the menus were planned for adequacy.

A market basket program has also been very popular with the Victory Kitchen audiences. In this demonstration a complete meal is prepared



"POWDERED DAYLIGHT" for war plants

• A vital chemical of war is "powdered daylight" – fluorescent powder that makes cool, glare-free, shadowless light to speed production in plants throughout America.

Complex compounds called phosphors are pulverized, refined and milled to the fineness of face powder. Precisely blended and mixed with binders to assure even coating, phosphor crystals are *fixed* inside the glass tube by high-temperature baking. There, in very low-pressure argon gas and mercury vapor, the "Black Light" magic of ultra-violet rays transforms phosphor energy into visible light more constant than daylight – and just as kind to the human eye.

THE HAND IS CAPTIVE TO THE EYE

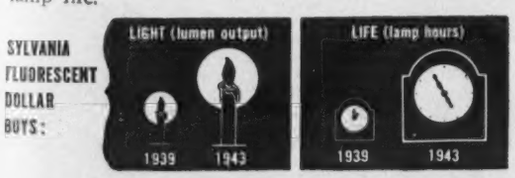
More than ten years of independent research have made coatings with smoother textures a unique feature of Sylvania Fluorescent Lamps. They have also brought other points of Sylvania Lamp superiority: uniform colors, higher light output and longer life – at progressively lower costs.*

Improvements take place every week at Sylvania. Many of them, like the "Mercury Bomb," conserve strategic materials and labor, and at the same time improve quality. All of them serve fluorescent progress, which is aggressively aimed toward ultimate home illumination when Victory is won.

While today's Sylvania Fluorescent Lamps are serving three-shift days in America's war plants, tomorrow's are being made even better. Make a business asset out of the lamp improvements developed by this constant research. Make permanent customers by selling Sylvania Fluorescent Lamps for replacements and for change-overs.

SELL SYLVANIA AND GIVE YOUR CUSTOMERS FAR MORE LIGHT AND LIFE FOR THEIR MONEY

*Compared with 1939 a dollar invested today in Sylvania Fluorescent Lamps buys more than four times the lumen output and approximately five times the lamp life.



(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)

SYLVANIA

ELECTRIC PRODUCTS INC.

formerly Hygrade Sylvania Corporation
Salem, Mass.

Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices.

HERE'S REAL NEWS!

New Guth Non-Metallic Reflectors Deliver More Light Than Porcelain Enamel!

4 Efficient Designs, for Every War Production Need!

GUTH Fluorescent is now made with Non-Metallic Reflectors to conserve vital materials for war industries. Yet this conversion has in no way necessitated any sacrifice in lighting efficiency! In fact the durable "300° White" synthetic Baked-Enamel, plus the engineered design, actually produces greater light output than do Porcelain Enameled Steel Reflectors! Get this quality lighting—now available in non-metallic units!

Original MAZE-LITE for 2-40, 3-40 to 2-100 watt with 77° light-cutoff
SUPER MAZE-LITE for 4-40 and 4-100 watt lamps. Powerful lighting units for high intensities and high bays
Where lamp-shielding is required EGGCRATE MAZE-LITE fills the bill. Eggcrates like reflector are of non-metallic materials.
FLUOFLECTOR units for 1 and 2 rows of lamps. For inspection lighting and over benches.

Write Today For Newest Literature

Leaders in Lighting Since 1902 — Guth

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

from market basket to table in 30 minutes. A narrator supplies the information on the nutritive value of the menu and the proper cookery methods, stressing the need for well-selected foods. This demonstration is effective in showing the busy homemaker how to provide adequate meals, even if time is limited.

Red Cross nutrition and canteen classes are held each week. Evening as well as afternoon classes are conducted, enabling working women to attend.

Among other activities of the kitchen, plans are now under way to have nutrition and cookery classes for women who are having to do the family cooking for the first time during the shortage of domestic help.

Puget Power's home service department is making a splendid contribution to the war program by helping thousands of home makers to select and prepare nutritionally adequate meals for their families, realizing that physical fitness through good nutrition will aid in war production by keeping workers on the job. With a constant demand for this information for the public good, a full schedule of programs is ahead for Victory Kitchen.

•

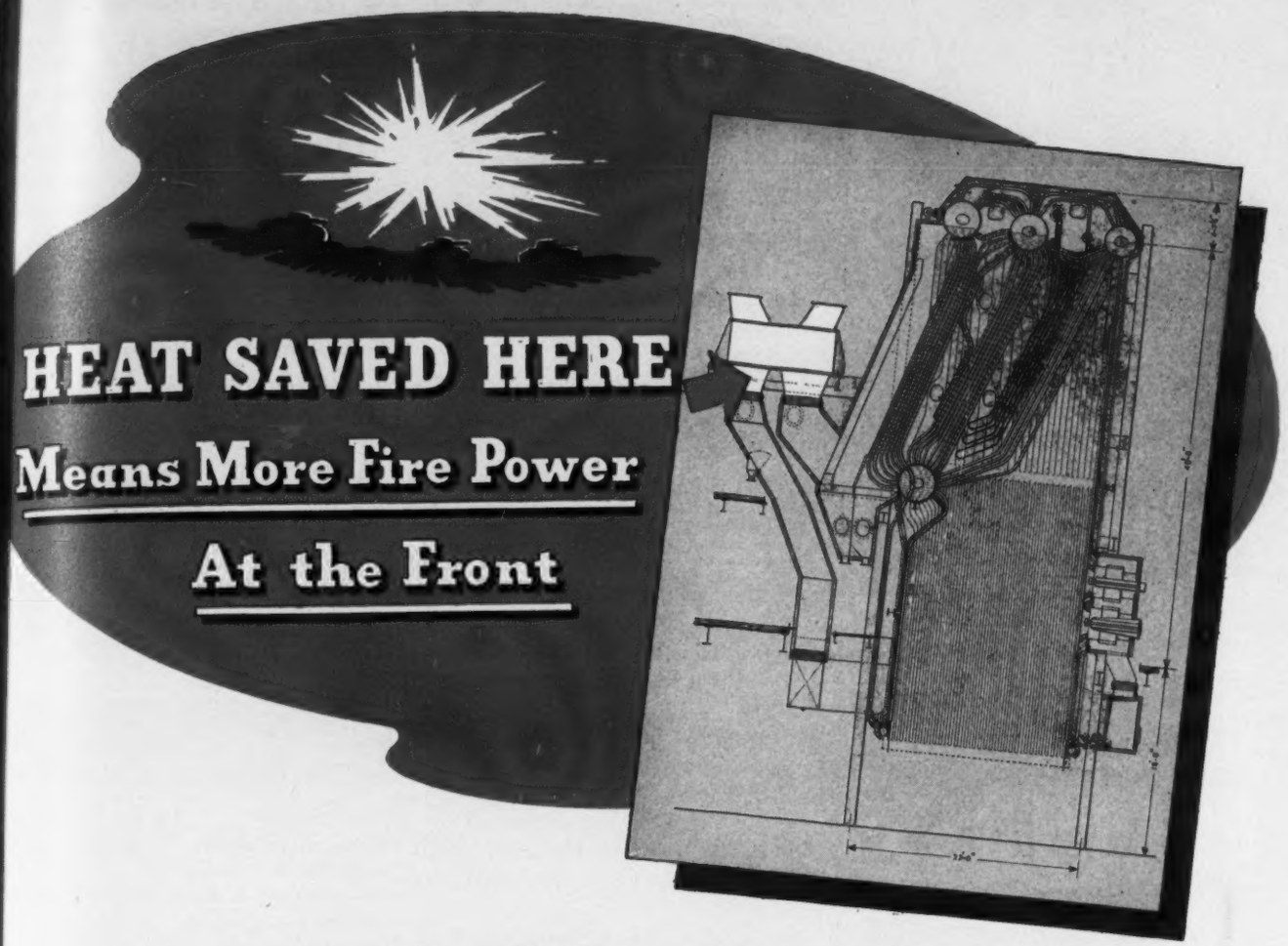
Omaha Surveys Its Residential Market

Three purposes underlie the wartime canvass of residential customers being conducted by the Nebraska Power Company in Omaha and Council Bluffs, Iowa. In order of importance, these objectives are: (1) To help customers understand and make the best use of electric service in wartime; (2) promote a better understanding of the company and the service it renders, and (3) sound out the potential post-war appliance market.

Results of the calls during the typical month of September give an insight into the effectiveness of this program and the thoroughness with which it is being conducted.

Interview completed	3,057
Interviews refused	41
Unfriendly attitude, left friendly	24
Unfriendly attitude, left uncertain	12
Complaints received	69
(High bill—40)	
Appliances restored to use	137
Appliances taken to dealers, repair	89
Appliances taken to company, repair	50
Recommended dealer repair	196

[Continued on page 106]



Ten new boilers like this at ordnance plants save fuel and steel with Ljungstrom Air Preheaters

Typical of the steam generating units being installed at a group of plants for munitions manufacture is this 135,000-lb.-per-hr. boiler, fired with powdered coal. Flue gases enter the Ljungstrom Air Preheater at 665 deg. F., leave at 351 deg., heating combustion air to 502 degrees.

• • • • •

Power plants that mean more fire power for American arms must go up fast, and then stay on the job without shut-downs. Yet conservation is as important here as elsewhere... every needless pound of steel must be spared, and every pound of fuel s-t-r-e-t-c-h-e-d by efficient combustion and maximum heat recovery.

For all these reasons, the uniform type of the steam generator chosen for this group of plants is equipped with the Ljungstrom Air Preheater.

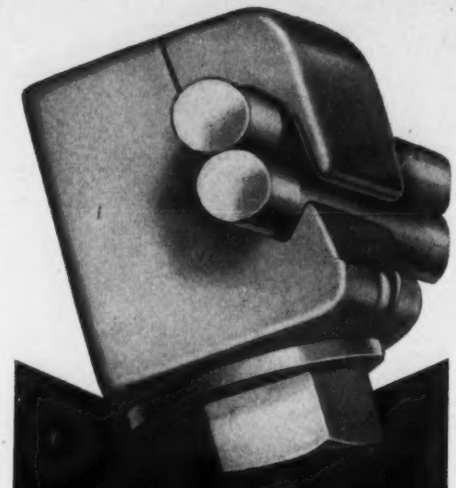
The *continuous regenerative counterflow* principle of the Ljungstrom greatly reduces its size and weight, often saving one-half the steel that would otherwise be required for the same heat recovery. Erection is simplified, the preheater reaches the job as a completely fabricated unit. Further material savings are made in the supporting structure.

If you are faced with a problem of wartime power generation, or any need for gas-to-air heat transfer at temperatures to 1400 deg. F., be sure to check the *conservation features* of a Ljungstrom. A factual booklet, "Another Kind of Air Power with a Wartime Job to Do", tells the story. Write for a copy.

THE

AIR PREHEATER
CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York



you'll like these

FARGO

FEATURES

1. Precision machine cut threads
2. Wide clamping areas
3. V-Grooves for perfect alignment
4. One-piece construction
5. Vise-like gripping

WHAT THEY MEAN TO YOU

These features give you a connector which provides high compression at low wrench force, high pressure contact between conductors, vibration-proof connections and many years of reusable life.

Next time specify FARGO the connector that "grips like a vise."

Made by

FARGO MFG. CO.

distributed by

LINE MATERIAL CO.

MILWAUKEE WISCONSIN

Minor repairs made in home	124
Lighting surveys arranged	619
Past war appliance prospects	
Lighting	288
Major appliances	339
Small appliances	142

The canvass was inaugurated in May. Since then it has, in addition to other objectives, been used to survey the electric refrigeration market in Omaha and Council Bluffs. Of all customers interviewed to date, it shows that:

71 percent use electric refrigeration
18 percent use ice
8 percent use gas
3 percent have no refrigeration

Of the electric refrigerators now in service among customers interviewed:

56 percent are 1-5 years old
33 percent are 6-10 years old
5 percent over 10 years old
6 percent age not known.

The interview program that revealed these important facts is not a shotgun, "ring-the-bell-and-run" type survey. It is highly personalized and requires the full time of 24 company representatives; ten home service girls and 14 appliance salesmen. Each interview requires 1 to 1½ hours to complete and covers all the aspects of electric service in the home from rates to the care and repair of appliances.

To personalize the interview and guide it along carefully planned lines, company representatives carry the "Wartime Message" folder, shown. This folder, when completely filled out at the end of the interview, is left with the customer as a permanent record and a carbon copy retained by the interviewer for the company files.

This folder reproduces an electric service bill which the interviewer fills out to show the customer how bills are calculated from meter readings. Space is also provided for recording energy use and cost of service by months for the past year and the average daily cost of service for that period. Breaking the cost of service down to the average cost per day and comparing it with other commodities purchased daily, such as bread, cigarettes, etc., has proved particularly effective in helping the customer to appreciate the cheapness of it.

Appliance Maintenance

An appliance record form is also provided which records: (1) Appliances in use; (2) idle appliances; (3) those needing repair, and (4) age of appliances or other data. Use of this form opens the interview to a discussion of appliance maintenance and repair and its wartime significance. As this part of the call develops the customer is told the few simple rules of appliance maintenance and given a list of appliance

PERSONALIZED "Wartime Message" folder guides survey of residential appliance use in Omaha; is used to explain billing procedure and encourage appliance repair

repair agencies in his neighborhood. Appliances are inspected, and if needed repairs are minor they are performed on the spot to show the customer how it is done. Customers are also taught how to replace fuses, thus eliminating many service calls.

Complaints bearing on service are recorded and transmitted to the proper company department for correction and, where high bill complaints are found, an attempt is made to show the reasons for the departure from what the customer considers "normal."

Post-War Stability

At its present rate of progress it will require two years to complete the survey of all residential customers. When it is completed, however, the information obtained on appliance markets in Omaha will be as complete as any in the country. In addition the company will be completely informed of the strength and weakness of its service in the public mind, a long step toward post-war stability.

BULLETIN BOARD

TO ALL EMPLOYES . . . . . .

We are engaged 100% in war work. In modern war proper communication between the various units engaged in combat is most important. We are manufacturing important items that are used in field communication, in airplane communication, in emergency field lighting, welding cables for the building of ships, tanks and other vital weapons of war. Our wires go into the building of camps and munition plants, and are an integral part of special tools. We also furnish many kinds of cables for railroads, utility services and mines. In other words, the products that you make play an important part wherever electricity, power, lighting and communication are necessary in this war. We have had letters from five of our boys in the service telling about using Rome Cable in the field.

Your work is very important in providing essential supplies to the boys and men in active service who are at grips with the enemy on various fronts. We count upon you to do your part.

"Rome Cable Quality Is In Your Hands"

Sincerely,

H. J. Lyett

President

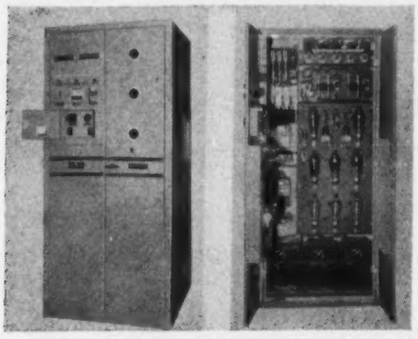
October 1st, 1942

ROME CABLE CORP. . . ROME, N.Y.

NEW EQUIPMENT

Electronic Control

Employing the energy-storage principle, new control consists of a charging circuit, a discharge circuit, control station, Pyranol capacitors and sequence control, and is



Electronic capacitor discharge resistance welding control. **General Electric Co.**, Schenectady, N. Y.

mounted in one cabinet-type inclosure. Charging- and discharge-tube circuits are mounted on a single, hinged compound base. Control station can be removed from cabinet and attached to the welding machine. Small wiring between panels and control station is brought to a centralized terminal board to facilitate checking circuits. This unit has been designed for resistance welding of aluminum.

•

Fluorescent Units

"Series 36-A" non-metallic industrial fluorescent lighting units; for chain or pipe hangers or surface mounting. **Lighting Products, Inc.**, Highland Park, Illinois.

New line of all non-metallic fluorescent units utilizes pressed hardboard reflectors, finished in "Klasium Luminex" (outside) and "Klasium White" (inside), with an appropriate reflection factor of 86 percent. Hardboard housings are said to be fireproofed. Ballasts, sockets and lamp starters installed and wired are mounted on housing, leaving reflector free for removal for servicing or cleaning.

•

Coating

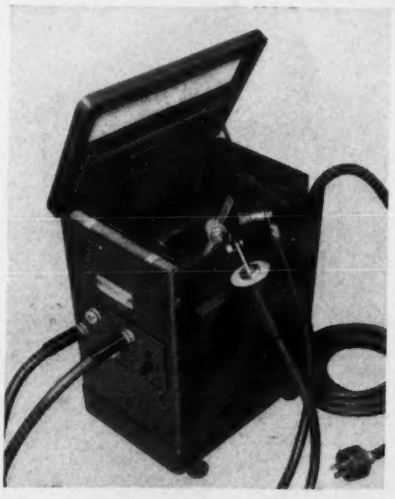
Arc-resisting coating for Bakelite and other phenolic compounds. **The Insl-X Co.**, 857 Meeker Ave., Brooklyn, N. Y.

Developed to prevent tracking and arcing, new coating is said to adhere to phenolic surfaces. According to tests conducted by the I-T-E Circuit Breaker Co., the new product increases dielectric characteristics without increasing thickness of the housing. Water-, acid- and alkali-resistant, the coating may be applied by dip, spray or brush and should be baked for one hour at 100 deg. C.

•

Metallizing Process Unit

Process for metallizing metal parts electrically is said to afford an adequate bond on the hardest surfaces and to simplify preparation of narrow edges, flat areas and cylindrical parts having keyways and other interruptions in their surfaces. The unit for application of the process is mounted on casters. Electrodes are applied with a special holder which uses up to six electrodes at a time, depending on the size and nature of the part to be prepared.



"Fuse-Bond" process equipment; for preparing metal parts for electric metallizing; operates on 110- or 220-volt, single-phase power line. **Metallizing Engineering Co., Inc.**, Long Island City, N. Y.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers, product data, names and addresses.

Multitester

Suitable for a wide range of shop, laboratory and field applications, new multitester combines in one instrument a.c.-d.c. voltmeter, milliameter, ammeter, capacity-

"Model 419" multitester; supplied as open-face bench instrument with a 4½-in. meter, also portable types in maple case with carrying handle and in steel case with 7¼-in. rectangular meter. **Radio City Products Co., Inc.**, 127 W. 26th St., New York, N. Y.

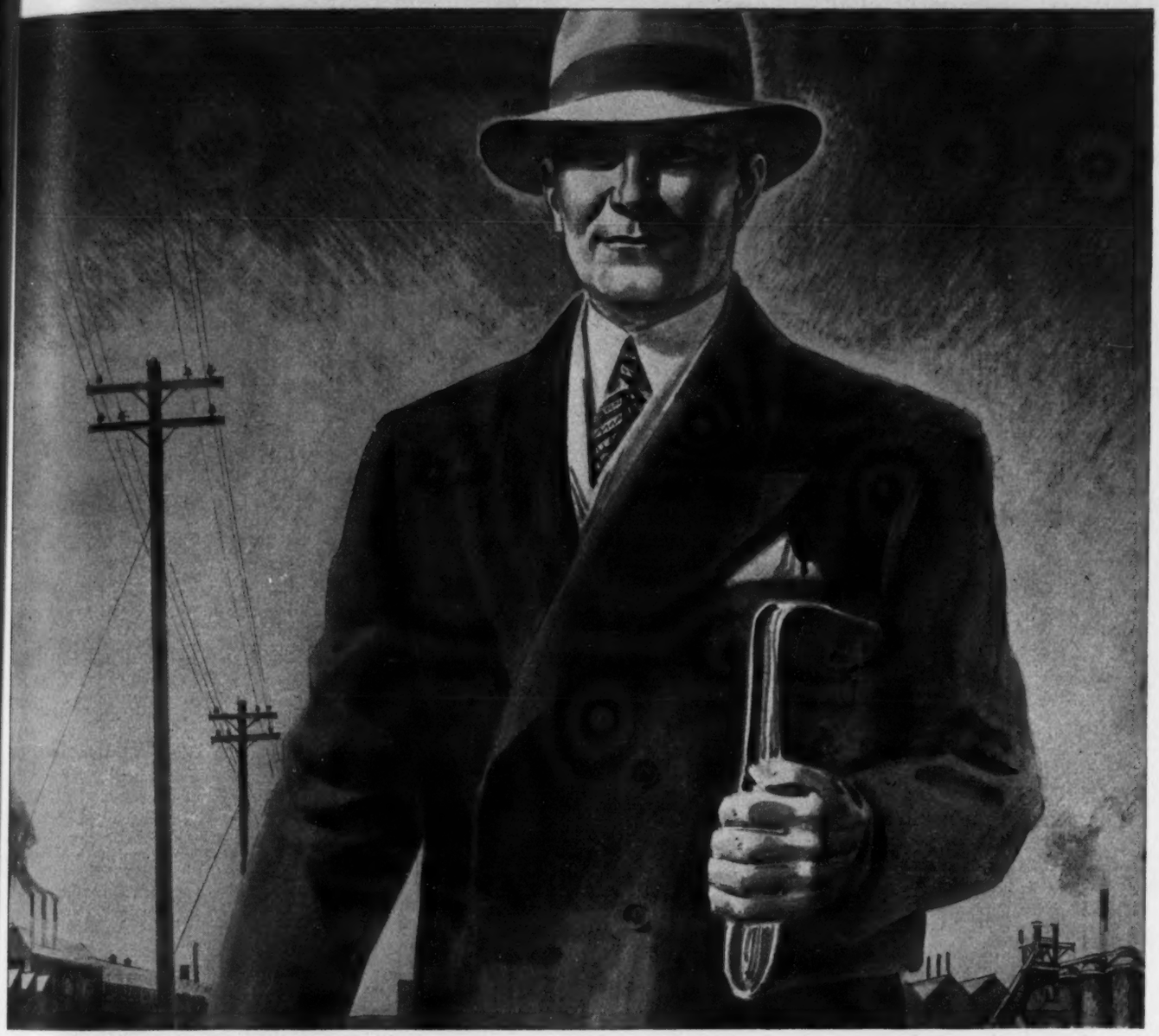
meter, ohmmeter and inductance meter. Incorporated in design is what is claimed to be a new system of a.c. measurements, eliminating the copper oxide rectifier. A.c. scales are linear with d.c. scales and sensitivity of meter is 2,000 ohms per volt, said to be accurate to within 2 percent. Ohmmeter has self-contained power supply.

•

Wire

"Rub-r-Less" wire, intended as a substitute for type "R" or "RP" in open wiring, concealed knob and tube work, armored cable, non-metallic sheathed cable and lead-covered wires and cables as prescribed by articles 320, 324, 334 and 336 respectively of 1940 National Electrical Code. **National Electric Products Corp.**, Pittsburgh, Pa.

New type of building wire has two 0.0016-in. strips of cellulose-acetate butyrate laid along opposite sides of the conductor (tinning omitted) and then lapped around it, forming two concentric tubes. Specially treated Kraft paper and then an over-all flame-retarding and highly moisture resistant fibrous covering is applied. Latter is bound with Rayon binder thread. Finished wire is said to present a smooth, even surface, free from tackiness, very similar in appearance to standard building wire.



KEEP THIS MAN IN MIND!

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TECHNICAL LITERATURE

SPECIFIC HEATS OF GASES—"Specific Heats of Certain Gases Over Wide Ranges of Pressures and Temperatures" is title of Bulletin No. 30 published by Engineering Experiment Station, Cornell University, Ithaca, N. Y. Single copy, no charge; additional copies, 50 cents each, to same person. Gases included are air, carbon dioxide, carbon monoxide, ethylene, hydrogen, methane, nitrogen and oxygen; range of temperature from 0 to 4,000 F., pressure from 0 to 10,000 psi.

TRANSFORMERS—An outline of lighting and power applications for dry-type transformers, details for specific applications, and wiring diagrams are contained in publication GEA 897J, "Dry-Type Transformers for Power and Lighting Circuits, 600 Volts and Below." Copy is obtainable from General Electric Co., Schenectady, N. Y.

DURONZE—Numerous curves showing cold drawing and annealing characteristics, as well as tables with physical properties of five different Duronze alloys are included in an 80-page booklet "Duronze Manual" obtainable from Bridgeport Brass Company, Bridgeport, Conn., when request is made on your company's letterhead.

BEARING LUBRICATION — Oil selection chart, viscosity-temperature chart, guide for use of greases for relubrication of ball bearings, functions of lubrication, greasing intervals, are some of the subjects covered in "A Guide to Better Bearing Lubrication" available from SKF Industries, Inc., Philadelphia, Pa.

V-BELT DRIVES—To educate power users in the proper procedure of selection, installation, and maintenance of their multiple V-belt drives, a book "23 Ways to Conserve the Life of Your Multiple V-Belt Drives" has been prepared by Engineering Research Bureau of the Multiple V-Belt Drive Association, 140 South Dearborn St., Chicago.

SIGNALING—Selection of audible signals, loudness ratings, location and number of signals, voltage recommendations, transformer sizes, and wire sizes are subjects covered in Bulletin No. 42-D, "Guide to Good Signaling" available from Schwarze Electric Co., Adrian, Mich.

FIRE EXTINGUISHERS—"Directions for Inspecting, Recharging, and Maintaining Portable Fire Extinguishers" is a folder prepared to assist users in proper maintenance of the equipment. It may be obtained from Pyrene Manufacturing Co., 560 Belmont Ave., Newark, N. J.

LIGHTING—General lighting design data, performance tables, also descriptions of individual lighting units are some subjects covered in "Lighting for Combat Operations and War Production," issued by the F. W. Wakefield Brass Co., Vermillion, Ohio.

COPPER AND ALLOYS—Sixth edition of "Revere Weights and Data Handbook" has revised chemical and physical properties, additional formulas for calculating weights, and a new section giving technical and mill definitions and illustrations of terms used in the copper and brass industry. Copy of handbook will be furnished by Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y., when request includes title or position and firm's name of the proposed recipient.